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ABSTRACT

This report details a benefit-cost analysis of the Perry Preschool program and describes the program's long-term effects. Conducted since 1962, research on the Perry Preschool program constitutes one of the strongest and best-known sources of support for the long-term efficacy of early intervention with disadvantaged children. The Perry Project collected data on 123 3- and 4-year-old disadvantaged black children (with no discernible physical handicaps) during the years of the preschool program, through the early elementary years, at age 15, and at age 19. Analysis of this data shows that the preschool program had a variety of significant positive effects on the children attending. These effects are the basis for comparing the economic benefits of one or two years of preschool. The report is divided into six sections, each dealing with a category of program effects, including the following: (1) the program and its immediate consequences, (2) elementary and secondary education, (3) higher education, (4) delinquency and crime, (5) welfare, and (6) employment and earnings. Each section discusses the data, assumptions, and methods used to evaluate costs and benefits, as well as the results. A seventh and final section presents an overall view of the benefit-cost analysis in terms of profitability. Finally, the report discusses some of the policy implications of the analysis and some of the issues that must be addressed in making public policy choices based on this evidence. (DST)

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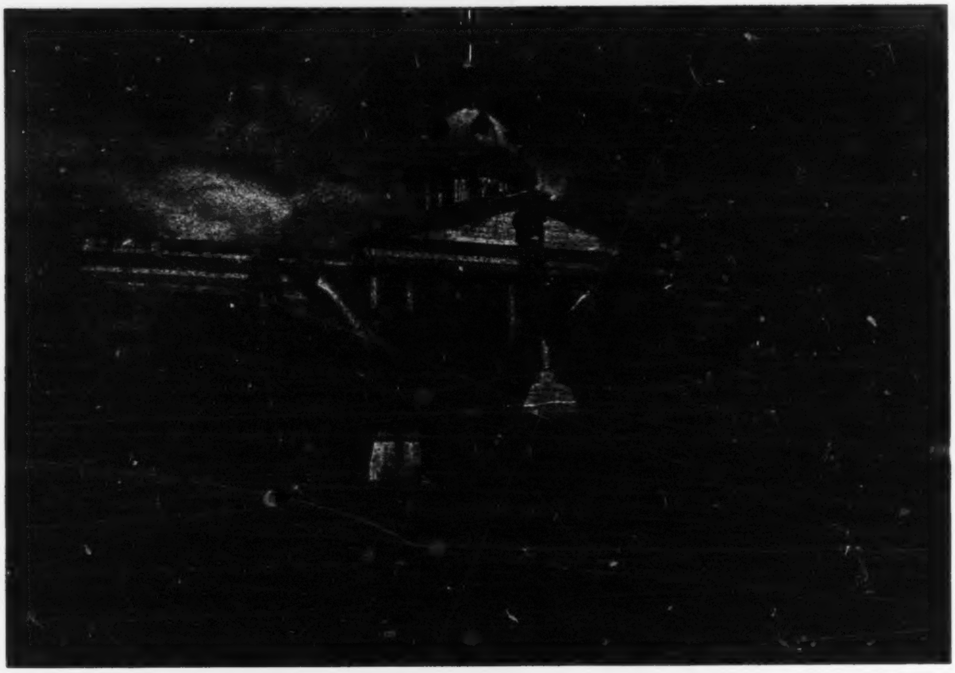
The Perry Preschool Program & Its Long-Term Effects:

A BENEFIT-COST ANALYSIS



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Lawrence J. Schweinhart and David P. Weikart, Series Editors

No. 2

High/Scope Early Childhood Policy Papers, No. 2

Lawrence J. Schweinhart and David P. Weikart, Series Editors

THE PERRY PRESCHOOL PROGRAM AND ITS LONG-TERM EFFECTS: A BENEFIT-COST ANALYSIS

by W. Steven Barnett

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Responsibility for the analysis and the views expressed in this report are the author's, and should not be ascribed to the sponsoring organizations or to those who have contributed to this work in other ways.

INTRODUCTION

The purpose of this report is to present in detail the benefit-cost analysis of the Perry Preschool program and its long-term effects. Research on the Perry Preschool program has been conducted since 1962, and its very positive findings have been widely reported. This research constitutes one of the strongest and best-known sources of support for the long-term efficacy of early intervention with disadvantaged children. Benefit-cost analysis applies the theories and methods of economics to explore the implications of the Perry Preschool findings for society as a whole. Such analyses are relatively rare and unfamiliar in early intervention research. Thus, we have attempted to provide a report that is generally accessible to early intervention researchers yet sufficiently technical for economists.

In trying to satisfy two audiences, this report is exposed to the dual risks of appearing abstruse to one audience and obtuse to the other. Although the use of economic jargon has been limited as much as possible, those with little knowledge of economics may encounter new concepts and a way of thinking that seems foreign to them. At the same time, economists may find that we sometimes communicate ideas less precisely than we might and give important issues less attention than they deserve. We hope that early intervention researchers will be led to a better understanding of the economics of early childhood programs and of the usefulness of benefit-cost analysis in program evaluation. We also hope that economists will find the detail and clarity of presentation sufficient to encourage the kind of competent and specific criticism that will improve any future benefit-cost analyses of early intervention programs.

The Perry Preschool Project

The Perry Preschool Project was conducted in Ypsilanti, Michigan, with children born between 1958 and 1962 inclusively. The study's subjects were 123 three- and four-year-old black children with no discernible physical handicaps. Subjects were selected on the basis of low parental educational attainment and socioeconomic status, and the subjects' low scores on the Stanford-Binet Intelligence Test (61-88). Subjects were assigned either to an experimental group who received the preschool program or to a control group who did not. This assignment was performed in such a way that these groups can be treated as independent samples drawn from the same population. This means that differences between the experimental and control groups can safely be attributed to the preschool program and are not attributable to initial differences between the two groups.[1]

The 123 children entered the study in five waves. The first two of these waves began in 1962--one wave at age 4 and the other at age 3. The remaining waves entered at age 3, one wave in each of the following three years. The number of experimental and control subjects in each wave is shown in Table 1.

Table 1

PARTICIPANTS IN THE PERRY PRESCHOOL PROJECT

Wave	Entry Year	Number of Experimentals	Number of Controls	Total
Zero	1962	13	15	28
One	1962	8	9	17
Two	1963	12	14	26
Three	1964	13	14	27
Four	1965	12	13	25
Total	1962-65	58	65	123

The 13 experimental group subjects in Wave Zero received only one year of the preschool program at age 4. The remaining 45 experimental group subjects received two years of the program, one at age 3 and one at age 4. Thus, the study provides some information about the costs and benefits of one year of preschool as opposed to two years, but based on a very small sample for one year.

In the benefit-cost analysis presented in the following chapters, the benefits of preschool are compared to both the cost of one year and the cost of two years of preschool. It is extremely important to note that the estimated benefits for both comparisons are based on the entire sample because the sample size for Wave Zero is too small to provide meaningful estimates by itself, and we cannot statistically differentiate the effects of one year of preschool from the effects of two years. The only substantive difference in the comparison of one and two years is the cost difference, which is estimated on the basis of actual costs of one year for all waves and of two years for Waves One through Four.[2]

The preschool program provided to the experimental group was operated for a relatively short school year, October through May, and had three elements. One was a center-based program for 2 1/2 hours each morning, five days a week. The curriculum was not constant but evolved over the years. The child-teacher ratio was relatively low, about 5 or 6 to 1. The teachers were certified in both special and early childhood education, and were relatively well paid. Another element of the program was home visiting. The teachers were to visit each child's home once a week in the afternoon for 1 1/2 hours. The final element was to encourage group meetings of parents. Actual attendance by the children and participation in home visits and group meetings by the parents varied considerably within the experimental group. More detailed descriptions of the program and curriculum are provided in the Monographs of the High/Scope Educational Research Foundation.

Summary of the Perry Preschool Project's Findings

The Perry Project collected data on both the experimental and control groups during the years of the preschool program, through their early elementary school years, at age 15, and most recently at age 19. Analysis of these data shows that the preschool program had a variety of significant positive effects on the lives of the experimental group. These positive effects are the basis for estimating economic benefits in the chapters that follow, and they will be discussed in more detail later. The effects have been reported in great detail elsewhere (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984). Some of the most important findings are summarized in Table 2.

Benefit-Cost Analysis

From the perspective of economics, the Perry Preschool program was an investment by the larger society in the lives of children whose chances for educational success, and thus for economic success, were relatively poor. This investment can be evaluated through benefit-cost analysis of the program and its results. The core of this evaluation is an assessment of the preschool investment according to the criteria of profitability, fairness, and merit. **Profitability** is the only one that can be completely assessed by a benefit-cost analysis. Therefore, most of this report is devoted to the details of the benefit-cost analysis and the application of the profitability criterion. In the case of **fairness**, benefit-cost analysis merely provides information for ethical judgments. The concluding chapter deals with some of the important implications of the benefit-cost analysis regarding fairness. **Merit** is explicitly considered only in this Introduction for reasons that will be explained.

This section provides a brief introduction to benefit-cost analysis. It explains the theoretical framework of benefit-cost analysis--what it attempts to do, the steps in its performance, and some of its limitations. It also explains the relation of benefit-cost analysis to the criteria of profitability and fairness. Although this section is written primarily for those who have relatively little prior knowledge of benefit-cost analysis, those already familiar with benefit-cost analysis may also find it useful.

Benefit-cost analysis seeks to determine if society as a whole can be made better off by undertaking a particular investment project. In the present case the question is asked retrospectively: Was society made better off by the Perry Preschool program? The benefit-cost analysis used to answer such a question can be described as a three-step process. The first step is to identify all the benefits and costs associated with the program. The second step is to estimate the economic values of benefits and costs. The third step is to apply an investment criterion to the estimated values of benefits and costs.

Identification of Benefits and Costs

The identification of benefits and costs depends on a thorough evaluation of the program and its consequences, intended and unintended, desirable and undesirable. This benefit-cost analysis builds on program records and two decades of longitudinal research on the effects of the Perry Preschool program. This research has been reported in earlier monographs of the High/Scope Educational Research Foundation and is not presented here except as it is needed to support the analysis. Evaluation of the Perry program has focused on the effects on participants alone. This is an insufficient basis for benefit-cost analysis that has a broader social perspective. There are costs and benefits to individuals who were not participants. These may be either direct, as when taxpayers bear the program costs, or indirect, as when the participants commit fewer crimes. In addition, for a variety of reasons the program's cost or benefit to society as a whole may differ from the costs or benefits to individuals immediately affected.

Table 2

MAJOR FINDINGS OF THE PERRY PRESCHOOL STUDY

Category	Number[a] Responding	Preschool Group	No-Preschool Group	p
Mean IQ at age 15	123	95	83	<.001
Age 15 achievement test	95	122.2	94.5	<.001
% of all school years in special education	112	16%	28%	.039
High school graduation (or equivalent)	121	67%	49%	.034
Post-secondary education	121	38%	21%	.029
Arrested or detained	121	31%	51%	.022
Females only: teen pregnancies per 100	49	64	117	.084
Receiving welfare at age 19	120	18%	32%	.044
Employed at age 19	121	50%	32%	.032

[a] Total n = 123.

Estimation of Economic Value

After identification of all costs and benefits, the next step is estimation of their economic value. This step is easiest when the effects are monetary, as in the case of explicit program costs. It is also relatively easy when effects are quantitatively measured and market prices are available for the effects. For example, if a law enforcement or safety program resulted in a reduction in minor auto accidents, the average market price of repairs for the damage in minor accidents could be used to estimate the benefit. Estimating economic value is most difficult, and sometimes impossible, when effects are measured qualitatively or when there are no market prices for the effects. Consider as an example a program that teaches parenting skills. One of its effects might be to decrease parental frustration and anxiety. Even if this effect is measured by questionnaire or observation, its economic value cannot be estimated from market information. Before continuing we should note that the economist's concept of cost differs from the ordinary one. The true resource cost of any activity is its opportunity cost—that is, the foregone benefits of alternative activities.

Application of an Investment Criterion

When the economic value of costs and benefits has been estimated, an investment criterion is applied to determine if the program is profitable for society as a whole. Several investment criteria are available, and their appropriateness depends on the situation in which they are used. A discussion of these criteria lies far outside the boundaries of this simple introduction. For the present analysis it was decided that the **net present value** criterion is most appropriate. This criterion requires that the present discounted value of benefits exceed that of costs.

Although the term sounds imposing, the criterion itself is easy to understand. A comparison of the simple sums of costs and benefits is an inadequate criterion for profitability because programs generally produce streams of costs and benefits over time, rather than producing all their effects at once. (In the case of early childhood programs, most of the costs are initial ones, while many of the benefits accrue later in life.) Merely valuing all effects monetarily will not make effects that occur at different times comparable, because it matters to people **when** they occur. Even in the absence of inflation, people are not generally willing to exchange a dollar now for a dollar in the future unless interest is added. Interest compensates the lender for the opportunity cost--the foregone alternatives to lending.

Effects that occur at different times are comparable only if they are adjusted to their value at a single time. This adjustment is made in two steps. First a price deflator is applied to the values to remove the effects of inflation. This puts all values in **constant dollars.** Second, a discount rate is applied to take into account opportunity cost. Most often, values of program effects are adjusted to the time the program began; value at this time is referred to as **present value.** When all effects have been adjusted to their present value, then subtracting costs from benefits yields the net present discounted value of the program to society as a whole. If this net value is present, then society is better off economically with the program than without it.[3] Table 3 presents an example of the use of a discount rate and the application of the net present value criterion for hypothetical program effects that have already been adjusted to constant dollars.

The usefulness of benefit-cost analysis is not limited to the determination of profitability. It also provides information relevant to another criterion--fairness. The concern in this case is with the distribution of costs and benefits across society, rather than the sum of costs and benefits for society as a whole. Some economists (e.g., Mishan, 1976) limit benefit-cost analysis to the evaluation of profitability. Others include the consideration of fairness. Whether or not the evaluation of distributional consequences is considered a part of benefit-cost analysis per se, it is almost always recommended in conjunction with benefit-cost analysis. There are at least two reasons for this. First, fairness is an important consideration in program selection, and there are often tradeoffs between fairness and profitability. In choices between policy alternatives, the choice that has the most desirable combination of profitability and fairness may not be the one that is most profitable. Second, the information about the distribution of benefits and costs is generally obtained in the course of evaluating profitability or can be obtained with relatively little additional effort. Our analysis primarily assesses profitability, but provides important additional information regarding fairness.

Economics does not provide criteria for the assessment of fairness as it does for profitability. Whether a given distribution of costs and benefits is fair must be determined by reference to some ethical standards. Most commonly, concern with fairness centers on program effects on the distribution of income, with programs that make the distribution more equal being favored over those that increase inequality. Concerns with fairness may be particularly important when a program has effects on those who face discrimination, so that special attention is paid to distributional implications for handicapped persons, women, and racial and ethnic minorities. Equality is not the only aspect of fairness that is important, however. One may also be concerned about the extent to which the interests of some are injured to further the interests of others. The profitability criterion of benefit-cost analysis requires that economic gains outweigh economic losses. Thus, if a program is profitable there is some hypothetical redistribution of gains and losses that will leave at least one person better off and no person worse off. The actual distribution of gains and losses from a profitable program may be quite different from this hypothesized optimum, however, so that while some people gain, others lose.

Table 3

CALCULATION OF NET PRESENT VALUE FROM CONSTANT DOLLAR FIGURES

Flow of Costs and Benefits from Program A: Undiscounted

Year	Cost	Benefit
1	$ 1,000	$ 0
2	1,000	0
3	1,000	1,000
4	500	1,500
5	0	1,100
Total	$ 3,500	$ 3,600

Flow of Costs and Benefits from Program A: Discounted at 5%

Year		Cost		Benefit
1	$\$1{,}000 / 1.05 =$	$ 952		$ 0
2	$1{,}000 / (1.05)^2 =$	907		0
3	$1{,}000 / (1.05)^3 =$	864	$\$1{,}000 / (1.05)^3 =$	864
4	$500 / (1.05)^4 =$	411	$1{,}500 / (1.05)^4 =$	1,234
5		0	$1{,}100 / (1.05)^5 =$	862
Total		$ 3,134		$ 2,960

Net Present Value: $2,960 - $3,134 = -$174

Conclusion: This hypothetical program is not a sound economic investment when judged by the net present value criterion (at a 5% discount rate), even though its undiscounted benefits exceed costs.

In the analysis presented in this report, distributional consequences are considered for two groups: one is the participants and their families; the other is the "taxpayers," an abstract representation of those who paid for the preschool program. The participants were from low-income families, were black, and had relatively poor educational prognoses at an early age. A program that aids people in these circumstances may decrease inequality in the national distribution of income and in the national distribution of educational experiences and outcomes. As just pointed out, one may also be concerned about the extent to which the interests of some are injured to further the interests of others. This provides a second source of interest in the program's consequences for participants, since they experience its direct effects. It is also a source of interest in the program's consequences for taxpayers, since they bear most of the direct costs. In addition, as a practical matter the benefits and costs to taxpayers may affect the chances that a program will be adopted as a public policy.

There is a third criterion for which benefit-cost analysis provides relevant information but which is not addressed in this analysis. This criterion is merit, the intrinsic value of a program and its consequences. The consideration of merit entails a substantial departure from the usual benefit-cost analysis. As developed by economists, this consideration involves at least the partial rejection of the economic measure of value; the concept of merit implies that there is some noneconomic criterion by which to judge a program. There is no need to consider merit unless the intrinsic value of a program differs so substantially from its economic value that the latter is an inappropriate guide to action. It cannot be stressed too greatly that the issue of merit is different from that of failing to measure the full economic value of an effect in a benefit-cost analysis. Merit requires that one assume some value different from economic value.

Even if a program should be judged by a noneconomic criterion and not by economic value alone, there are still several reasons to perform benefit-cost analysis. First, the class of goods and services for which intrinsic value differs substantially from market value may be relatively small. In this case, accounting for intrinsic merit requires only minor, or at least relatively easy, adjustments to a benefit-cost analysis. Second, most people behave as if most goods and services are valued at their economic value. The vast majority of everyday economic decisions are based on economic value. Therefore, benefit-cost analysis offers the advantage of consistency in comparing public decisions to private ones, for it evaluates both in terms of the same criterion. Third, in practical terms, it is difficult to find a standard of value to use in program evaluation that would be more widely agreed upon than economic value. Thus, when a program is evaluated in terms of its intrinsic merit, many people still want to know what the consequences are in terms of economic value.

The difficulties encountered in the use of a merit criterion are at least as great as those encountered in the use of the profitability criterion. The standards by which intrinsic value of a program is judged may be rather imprecisely defined and the program's tradeoffs between goods, unclear. The issue of tradeoffs needs to be emphasized. Often when appeal to intrinsic value is made, it is stated that some good should be provided to everyone no matter what the cost. This statement is made as if no tradeoffs were involved. Whether the intrinsically valuable good is medical care, food, or education, the reality of our world is that the choice to provide a good to some people is a choice not to provide some goods to others. Thus, providing medical care to one person invariably implies that someone else remains hungry, uneducated, or without medical care. The problem of tradeoffs is particularly acute in the case of goods that are said to have infinite intrinsic value, such as the saving of a human life, because the resources available to produce these goods are not infinite. Even in considerations of merit, an analogue to benefit-cost analysis is required, to take into account the tradeoffs that must be made.

Now that intrinsic value is distinguished from economic value, it is worth exploring how the two are interrelated. In benefit-cost analysis the economic value of a program's effect is the money value placed on it by each person affected. However, since persons to a certain extent recognize and act on intrinsic value, this cannot help but be reflected in economic value. As a result, it is incorrect to say that because benefit-cost analysis is based on economic value, it undervalues human lives. Benefit-cost analysis simply attempts to determine the tradeoffs that people are willing to make, and actually do make, based on their own judgments of intrinsic value. Thus, there is a sense in which benefit-cost analysis represents the value judgments of every person.[4]

This concludes the introduction to the benefit-cost analysis. Readers who are interested in a more extensive introduction are referred to the excellent treatments of this subject by Edward Gramlich (1981), Edward Mishan (1976), and Mark Thompson (1980). These books also provide extensive bibliographies for those interested in pursuing specific issues in benefit-cost analysis.

Outline of the Report

The report of the benefit-cost analysis is divided into six sections, each dealing with a category of program effects. The categories are these: (1) the program and its immediate consequences, (2) elementary and secondary education, (3) higher education, (4) delinquency and crime, (5) welfare, and (6) employment and earnings. Each section discusses the data, assumptions, and methods used to evaluate costs and benefits, as well as the results. A seventh and final section brings together the results of the earlier sections to present an overall view of the benefit-cost analysis in terms of profitability. In addition, the distribution of costs and benefits is examined to consider its fairness. Finally, we explore some of the policy implications of the analysis, and some of the issues that must be addressed in making public policy choices based on this evidence.

Footnotes

[1] The original sample contained 128 children. There were some variations from true random assignment, but the evidence indicates that these do not significantly affect the results. For more detailed discussions of sample selection and assignment and of the effects of variation from random assignment, the reader is referred to Weikart, Bond, and McNeil (1978) and Berrueta-Clement, Schweinhart, Barnett, Epstein, and Weikart (1984).

[2] The sample size is too small to permit us to draw much in the way of conclusions about one year versus two years of preschool. As might be expected, all of the statistically significant findings for the full sample cannot be replicated for Wave Zero alone (one year, $\underline{n}$=28). We have also found, however, that the findings cannot all be replicated for Waves One through Four combined (two years, $\underline{n}$=95). Only with the full sample do all the important findings hold.

[3] This assumes that there are no other programs under consideration that have been shown to yield a greater net present value. Relatively few benefit-cost analyses are performed for public programs, and it seems reasonable that programs that have demonstrated positive returns should be favored over programs that do not.

[4] The dependence of benefit-cost analysis on individuals' value judgments raises another important theoretical issue. Educational programs affect values, as well as knowledge and abilities. The question immediately arises as to how, or whether, to determine the economic value of changes in values. Clearly, one can seek to determine the economic value of the consequences to some people of changes in the values of others. However, it does not seem sensible to ask people how much changes in their own values are worth to them. Moreover, if values are altered on a large scale, then it seems likely that the tradeoffs people are willing to make will be altered in a significant way. When values are altered by a program, some incomparability is introduced between the world before and that after the program. If the change in values is relatively slight or involves only a few people, then its effects can probably be safely ignored. We believe this to be the case for the program analyzed in this report because it significantly affected only a small number of people. The issue becomes more difficult when one considers providing preschool to a large proportion of the population.

CHAPTER 1

THE PRESCHOOL PROGRAM

Data on Program Costs

The Perry Preschool program is described in several publications of the High/Scope Foundation, beginning with Preschool Intervention (1967) edited by David Weikart, and continuing more recently with Young Children Grow Up (1980) by Lawrence Schweinhart and David Weikart. These documents and the personal recollections of some of the program's teachers and administrators are the basis for the program description used in estimating costs. The program cost was essentially the same each year. A few relatively minor variations in the program are ignored because their implications for the program and its costs are considered to be insubstantial.[1]

Information about program costs was obtained from several sources including Ypsilanti school budgets, the Ypsilanti school system's accounting department records, and the program's administrator. Much of this information had been collected in 1975 by Carol U. Weber. These sources provide information about the taxpayers' cost of the program but not about costs that were borne by the participants, or about any of the immediate benefits of the program. Program records of the time spent in various activities are the primary source of information about immediate effects on program participants.

Method of Estimating Program Costs

In this chapter we estimate the monetary value of the Perry Preschool program's immediate effects, that is, effects that occurred during the one or two years that a child was in the program. There are immediate effects on taxpayers, parents, and children. The effects on taxpayers are the explicit and implicit costs of the program that are borne by the school system. The effects on parents are the implicit costs and benefits associated with their direct participation and their efforts to facilitate the participation of their children. The effects on children are the costs and benefits associated with direct participation. For both parents and children it is the value of the program as a consumer service (rather than as an investment with later payoffs) that is estimated as a benefit in this part of the analysis.

Taxpayer costs of the program have by far the greatest economic impact of any immediate program effect and receive a proportionate amount of attention in this section. These costs can be divided into explicit and implicit program costs and are presented in Table 4. Explicit costs are subdivided into five categories: instruction, administration and support staff, overhead, supplies, and screening. Implicit costs have only one category--interest and depreciation. Unless otherwise noted, all figures are in "current dollars" in this and subsequent tables. That is, dollar value is for the year in which the cost or benefit occurred.[2]

Table 4

PERRY PRESCHOOL PROGRAM COSTS
(CURRENT DOLLARS)

Type of Cost	1962-63 (n=21)	1963-64 (n=20)	1964-65 (n=25)	1965-66 (n=25)	1966-67 (n=12)
Explicit					
Instruction	$25,853	$26,251	$27,764	$29,778	$16,832
Administration & support staff	1,134	1,100	1,425	1,500	768
Overhead	1,722	1,600	2,100	2,225	1,188
Supplies	480	480	480	480	250
Screening	234	115	120	120	0
Implicit					
Interest & depreciation	$ 2,337	$ 2,236	$ 2,762	$ 2,815	$ 1,387

Instruction costs are teacher salaries, fringe benefits, and the employer share of the social security tax. The actual salary figures for the preschool teachers were obtained from the Ypsilanti school system's accounting files. The employer's share of the social security tax was calculated on the basis of salary figures. At the time of the Perry Preschool program (1962-1967), state contribution to a retirement plan was the only fringe benefit, and this was determined as a percent of teacher salary. These percents (obtained from the Michigan Public School Employees Retirement System) were applied to the teacher salaries. The calculation of instruction costs, by year, is presented in Table 5.

Administration and support staff represent the contribution of nonteaching special education staff to the preschool program, including the management of the program by the Special Services Director. This cost was estimated from the average per-child cost of the Director's office for 1968-1969 (adjusted for inflation), the earliest year for which the data needed to calculate it were available. Data were obtained from Ypsilanti School District Annual Audit Reports or Budgets (Weber, 1975, p. 308). The estimation of administration and support staff costs is presented in Table 6.

Overhead accounts for the preschool program's share of the general administrative and nonteaching staff, maintenance, utilities, and other general school system costs. Data for overhead were obtained from Ypsilanti School District Annual Audit Reports. An average overhead cost per child was calculated using the total numbers of children in the school system (Weber, 1975, p. 49), and this average cost figure was applied to the preschool program.[3] The resulting estimation of total overhead costs for the preschool program is presented in Table 7.

Table 5

INSTRUCTION COSTS
(CURRENT DOLLARS)

Category	1962-63	1963-64	1964-65	1965-66	1966-67
Teacher salaries (4)					
	$ 6,260	$ 5,720	$ 6,270	$ 7,700	$ 7,720
	6,150	6,490	6,160	5,710	6,178
	6,040	6,270	6,930	6,930	8,260
	5,600	5,830	6,380	7,150	7,366
Total	**$24,050**	**$24,310**	**$25,740**	**$27,490**	**$29,523**
State retirement fund payments					
State contribution as % of salaries	5.00%	5.12%	5.16%	5.79%	5.89%
Total state contribution	**$ 1,203**	**$ 1,245**	**$ 1,328**	**$ 1,592**	**$ 1,739**
Employer-paid Social Security					
Maximum taxable earnings	$ 4,800	$ 4,800	$ 4,800	$ 4,800	$ 6,600
Taxable earnings, 4 teachers	$19,200	$19,200	$19,200	$19,200	$25,977[a]
Times employer tax rate	3.125%	3.625%	3.625%	3.625%	3.85%
Total Social Security	**$ 600**	**$ 696**	**$ 696**	**$ 696**	**$ 1,000**
Total instructional costs					
Salaries	**$24,050**	**$24,310**	**$25,740**	**$27,490**	**$29,523**
Retirement fund	**1,203**	**1,245**	**1,328**	**1,592**	**1,739**
Social Security	**600**	**696**	**696**	**696**	**1,000**
Times proportion of preschoolers in Perry study (if less than 100%)					12/23
Total	**$25,853**	**$26,251**	**$27,764**	**$29,778**	**$32,262**

[a] Includes one salary below the maximum, $6,178.

Table 6

SPECIAL SERVICES
ADMINISTRATION AND SUPPORT STAFF COSTS
(CURRENT DOLLARS)

Year	Cost per Child[a]	Number of Students	Total Cost
1962-63	$54	21	$1,134
1963-64	55	20	1,100
1964-65	57	25	1,425
1965-66	60	25	1,500
1966-67	64	12	768

[a] Cost per child is based on the 1968-69 average of $72 per student, a total of $43,747 for 609 students; the average cost per student for 1968-73 was $68. The special education budget includes a director, a secretary, and special education support staff.

Table 7

OVERHEAD COSTS (CURRENT DOLLARS)

Year	Average Overhead Cost per Student	Number of Students	Total Overhead
1962-63	$82	21	$1,722
1963-64	80	20	1,600
1964-65	84	25	2,100
1965-66	89	25	2,225
1966-67	99	12	1,188

Supplies represents the costs of equipping the classroom each year.[4] This category includes the costs of food for daily snacks as well as of materials used by the children. Each year $480 was allotted to the preschool program for these costs. Because only 12 of the 23 children in the 1966-67 school year were participants in this study, supply costs were prorated as were instruction costs. Costs for supplies are reported in Table 4.

Screening accounts for the costs of testing and interviewing to select a sample that was economically disadvantaged and had a relatively poor prognosis for educational success. Fifty children were screened for each wave at a cost of about $250 to select children for both the experimental and control groups.[5] The costs of screening are included in Table 4, prorated to reflect only the cost for,those who attended preschool. Calculations are shown in Table 8. Although the costs of screening are certainly part of the costs of performing the experiment, it is less clear that they should be considered part of the cost of treatment. If screening to select a disadvantaged sample is needed to secure the level of benefits observed in this experiment because the benefits would be lower for a sample of children selected without screening (something we do not know), then screening costs are properly included. If this is not the case, and even if screening has some direct effect on benefits (e.g., the children gain experience in test taking), the cost is not properly included because the control group, whose benefits are compared with the experimental group's benefits, was also screened. The most conservative position is assumed, and screening costs for the experimental group are included as part of the cost of the program.

Table 8

EXPERIMENTAL GROUP'S SHARE OF SCREENING COSTS
(CURRENT DOLLARS)

Wave	Number of Experimentals	Number of Controls	Experimentals as % of Total	Screening Cost		
				Total	Experimentals	Per Experimental
Zero	13	15	46%	$250	$116	$ 9
One	8	9	47	250	118	15
Two	12	14	46	250	115	10
Three	13	14	48	250	120	9
Four	12	13	48	250	120	10

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The implicit program costs are imputed **interest and depreciation** on fixed capital. Imputed interest is calculated to account for the income foregone when fixed assets were employed in the preschool program. In other words, it is assumed that if these assets had not been used for the preschool program, they would have been used in some other way that benefits society. These foregone benefits are costs of the preschool program and are accounted for by imputing interest on the fixed capital. This analysis assumes an implicit interest rate of 3.5 percent.[6] Depreciation is calculated to account for the decrease in value of the fixed capital due to wear, age, and other causes. Straight line depreciation is used (e.g., 10 percent each year for ten years). Depreciation rates vary with the type of assets. We assumed a 10 percent rate for all equipment and a 3 percent rate for buildings, based on IRS asset guideline periods and other information on the useful life of school property.[7]

There are two categories of fixed capital to be considered for the preschool program. One is the equipment purchased for initial set-up of the preschool classroom. The value of this equipment was $1,000 in 1962.[8] The implicit interest and depreciation rate for this equipment is 13.5 percent. The other category of fixed capital is the Ypsilanti school district's physical plant and general equipment. It is assumed that preschool students shared approximately equally with other students in use of this fixed capital. To figure depreciation for this second category, it was necessary to determine the distribution of school district assets by type. Table 9 shows this distribution for each year for which it could be ascertained. Based on the average distribution, a weighted average of 3.7 percent was obtained for the depreciation rate, resulting in a combined rate of 7.2 percent for implicit interest and depreciation. The calculation of interest and depreciation for each year using these rates is presented in Table 10.

In addition to the taxpayer costs of the preschool program, there were costs to the participants and their families. None of these costs were explicit, however. There were no fees, and all school supplies were provided by the program.[9] The only resource required of the families was their time. The use of time is an implicit cost of the preschool program.

While it may seem a bit odd, it is appropriate to estimate the value of the time cost to the children participating, as well as to their parents. The time cost to the child is the value of the alternative experiences foregone to attend preschool and the home visits. Set against this cost is the value of the immediate benefits the child received by attending. It would be difficult to measure either the cost or benefits with any precision, however there is some information that can reduce the uncertainty about the net result. First, attendance was not mandatory, if costs exceeded benefits, a child could stay home. Second, the program was designed to be a pleasant and enriching experience. Thus it seems quite likely that there was a net benefit for the child.[10] We assumed a net effect of zero dollars for the child.

Table 9

DISTRIBUTION OF FIXED CAPITAL OF YPSILANTI SCHOOL DISTRICT

	% in Each Category		
Year	Land	Buildings	Equipment
1979-80	3.85%	83.86%	12.30%
1978-79	4.01	83.17	12.82
1977-78	3.67	85.06	11.27
1976-77	4.16	84.46	11.37
1975-76	6.25	80.39	13.36
1974-75	6.79	80.33	13.38
1973-74	5.90	81.53	12.57
Average	4.95%	82.69%	12.44%
Depreciation rate	0%	3.00%	10.00%
Weighted average[a] (average times depreciation rate)	0%	2.48%	1.24%

[a] The sum of the weighted averages is 3.72%.

The parents' costs and benefits can be estimated in much the same way as the children's, although with slightly more complexity. Costs are imposed on the parents by the time required for the home visits. Benefits are provided by the child care service they receive, which releases them from child care (or the expense of other child care arrangements) and provides an enjoyable experience for their child. Benefits may also be provided by the home visits.

The assessment of parental costs and benefits was performed for preschool attendance and home vists separately. Parental time required by preschool attendance seems likely to have been negligible. Many children walked to the school with their older siblings. The benefit from the child care service is estimated from data on the amounts that parents generally paid for "nursery school." The estimated cash payment per hour per child is quite low, \$1.03 (in 1981 dollars), and there are several reasons to consider it an underestimate.[11] The total estimated value of child care services is calculated to be about \$300 per child each year, as shown in Table 11.

Parental involvement in the home visits was to a great extent voluntary. Parents could and did choose not to participate; they could, for example, engage in other household activities during the visit. Thus, parental participation in the visits may be interpreted as evidence that participation was, in the parent's own judgment, preferred to the best alternative use of time. In this case the cost of parental time for the home visits is at least offset by the benefits from participating in the home visits.[12] The net effect of home visits is therefore estimated to be zero dollars. Even under the alternative assumption that some parents felt compelled to participate (for example, because they feared that their child might not be treated as well or even dropped from the preschool program) the marginal cost of parental time was quite low, and our estimate of zero dollars would not be far off.[13]

Table 10

CALCULATION OF IMPLICIT INTEREST AND DEPRECIATION
(CURRENT DOLLARS)

Category	1962-63	1963-64	1964-65	1965-66	1966-67
School district assets ('000s)	$10,386	$10,393	$10,489	$10,593	$10,982
Number of students	7,132[a]	7,132	7,205	7,146[b]	7,264[b]
Assets per student	1,456	1,457	1,456	1,482	1,512
Number of preschool students	21	20	25	25	12
Preschool assets per year	30,582	29,145	36,395	37,056	18,143
Implicit interest and depreciation:					
On school district fixed capital[c]	$2,202	$2,098	$2,620	$2,668	$1,306
On classroom equipment[d]	135	138	142	147	81
Total	$2,337	$2,236	$2,762	$2,815	$1,387

[a] Number of students for 1962-63 not available; 1963-64 number used as estimate.

[b] Full-time equivalents.

[c] Preschool assets per year times 7.2%, the rate of implicit interest plus depreciation.

[d] Initial investment in classroom equipment was $1,000; interest and depreciation rate was 13.5%--$135 in 1962-63 dollars.

Table 11

VALUE OF CHILD CARE PROVIDED BY ONE YEAR OF PRESCHOOL (CONSTANT 1981 DOLLARS)

Estimated value per hour	$ 1.03
Hours per day	x 2.5
Value per day	$ 2.58
Days of preschool program	x 145
	$373.38
Attendance rate (based on Perry Preschool attendance record)	x 0.80
Total value of child care per child year	$298.70

Findings for Program Costs

The immediate taxpayer cost per child for the Perry Preschool program is presented in Table 12 for each wave and year. These costs were calculated from the data summarized in Table 13 and are presented both in current dollars and in constant 1981 dollars.[14] These cost figures should be considered upper-bound estimates of actual costs because the categories of administration and support staff, overhead, and interest and depreciation were calculated on the basis of average cost, rather than marginal cost. For at least two reasons marginal cost may have been below average cost. First, there is a potential savings from economies of scale. No increases in administrative and support staff in special services or general school district administration resulted from the preschool program, although this by itself is not sufficient to establish that marginal cost was substantially below average cost, since the preschool program may have diverted resources from other uses. Second, there is a potential savings from the use of slack resources. In particular, the preschool program used classrooms that the school system would not have used otherwise, and that institutional constraints prevented from use in nonschool activities, at least in the short run. Nevertheless, in our judgment the upward bias resulting from the excess of average over marginal costs is relatively small, perhaps less than 10 percent.[15] Because of the tendency for marginal cost to equal average cost in the long run, the upward bias could be substantially less than 10 percent. In any event, use of the cost figures in Table 12 is a conservative strategy; any adjustment to these figures to reduce the upward bias risks introducing a downward bias that could lead us to falsely accept the hypothesis that the preschool program is a good investment.

The cost estimates derived above represent the actual costs to society of the Perry Preschool program. They do not necessarily represent the minimum cost of producing the program's results.[16] There is no prima-facie evidence that the Perry Preschool program operated at the lowest cost per student consistent with the effects produced. It was an experimental program dealing with many unknowns, and there was little knowledge about how expensive a program was necessary for long term effectiveness. In addition, there is evidence from the program that it could have operated at lower cost. The child-teacher ratio, a major determinant of program cost, varied between 4 to 1 and 6.25 to 1 with no perceptible influence on program results. The implication is that nothing was gained from the extra expense of the years with lower numbers of children per teacher; they were simply less efficient years. It may be that increases in the number of children per teacher beyond the highest number of the Perry Preschool program are possible with little or no effect on program results. Thus, the minimum cost of producing the program results is at least as low as the Perry Preschool program's lowest cost, and may be lower. Evidence for an even lower cost must come from other studies, however.

Table 12

PERRY PRESCHOOL PROGRAM COSTS PER CHILD

	1962-63		1963-64		1964-65		1965-66		1966-67
Program Costs	Wave 0	Wave 1	Wave 1	Wave 2	Wave 2	Wave 3	Wave 3	Wave 4	Wave 4
In current dollars	$1,510	$1,516	$1,583	$1,593	$1,381	$1,389	$1,472	$1,482	$1,702
In constant 1981 dollars	5,223	5,172	5,287	5,320	4,501	4,527	4,624	4,655	5,044

As indicated by Table 12, only the 13 experimental-group children in Wave Zero had one year of the preschool program, attending only at age 4. The other waves attended two years, beginning at age 3. When we compare Wave Zero program effects to those for the other waves, we find no difference however. This suggests that only one year (at age 4) is warranted, a conclusion with important economic implications, since one year is roughly half the cost of two. With this in mind, the benefit-cost analysis has been conducted for both one and two years of preschool. To estimate the cost of a one-year program, a weighted average (weighted by the number of preschool participants in each wave) of first years for all waves was calculated. To estimate the cost of a two-year program, weighted average costs were calculated for first and second years for Waves One through Four. These estimates are reported in Table 13.

Compared to the immediate taxpayer cost, the immediate net benefits to the participants are rather small. The estimated value is $300. This is admittedly an underestimate, but no grounds were found for adjusting it upward by any specific amount. Undoubtedly many people will be of the opinion that the experiences provided by the program to the children and their parents were worth considerably more to society than $300. However, even if their value were ten times this estimate, these immediate benefits would not justify a program as costly as the Perry Preschool program. Clearly, if preschool is to be a worthwhile investment, it must yield substantial future benefits. The value of these future benefits is the subject of the chapters that follow.

Table 13

AVERAGE PERRY PRESCHOOL PROGRAM COSTS PER CHILD (CONSTANT 1981 DOLLARS)

Discounting Alternative	One Year	Two Years		
		Year 1	Year 2	Total
Undiscounted	$4,963	$4,821	$4,887	$9,708
Discounted at 3%	4,818	4,544	4,745	9,289
Discounted at 5%	4,726	4,373	4,654	9,027
Discounted at 7%	4,638	4,211	4,567	8,778

Footnotes

[1] For example, the first year the program operated out of a church basement across the street from the elementary school. The following year, classrooms became available in the school. Also in the first year, there were seven meetings of some of the fathers with a school social worker. Fathers' meetings were not organized in later years, at least partly because this male social worker left the school.

[2] In the presence of inflation, the value of a dollar will differ from year to year. In later tables some figures will be expressed in "constant dollars". That is, they are adjusted for inflation to the value of dollars in a single year (1981).

[3] The overhead figure includes some relatively minor amount for transportation. Not all children in the school district were provided transportation; in particular the Perry children walked. For this reason overhead may be somewhat overestimated. On the other hand, other characteristics, such as their relatively high absence rate (and attendant administrative costs) could have increased their relative share of overhead cost. In any case, data on overhead are not sufficient to disaggregate it, so that no better estimate can be readily constructed.

[4] In an earlier High/Scope economic analysis (Weber, Foster & Weikart, 1978, p. 33) the category of "Supplies" is called "Teacher Allotments." The amount of the allotment was verified by Dr. David Weikart, Director of the Perry Preschool program.

[5] The cost of screening was estimated by Dr. David Weikart. One purpose of screening was to exclude children from the study who had identifiable physical impairments or physical conditions associated with impaired mental functioning; their inclusion would have complicated interpretation of the findings.

[6] The 3.5 percent rate approximates the rate of growth of the economy as a whole and thus the return to the aggregate capital stock. We could have varied this as we did the discount rate, but the effect on the results would be too small to warrant the effort.

[7] IRS Publication No. 543 (p. 27) gives an asset guideline period for depreciation based on a useful life of 10 years (implying a 10 percent rate) for office equipment and furniture, and 9 years (implying an 11 percent rate) for buses. The useful life of an office building is estimated to be 45 years (implying a 2.2 percent rate), but Shultz (1971) estimates a rate of 3 percent for school buildings based on R. Rude's unpublished National Bureau of Economic Research study Assets of Private Non-Profit Institutions in the United States, 1890-1948 (1954), and we use this more relevant estimate.

[8] This value is reported by Dr. David Weikart, Director of the Perry Preschool Program.

[9] In an earlier analysis (Weber, Foster & Weikart, 1978), an estimated value for purchases of school clothing was included. The current analysis omits this item on the grounds that any marginal difference in clothing expenditures resulting from preschool program attendance was largely offset by the consumer value yielded by that clothing.

[10] The children who attended preschool may also have foregone experiences that generated future benefit to those who did not attend preschool. This may also be considered an opportunity cost of attending preschool. However, this is taken into account implicitly in the comparison of later life outcomes between the two groups.

[11] The estimated payment per hour of child care was obtained from Rodes (1975) and Rodes and Moore (1975). They report the average cash cost of "nursery school," for those who paid cash, to be $0.66 per service hour. This is $1.03 in 1981 dollars. The estimate of $1.03 tends to be an underestimate for at least two reasons. First, it underestimates the market price for child care because many transactions involve service and in-kind exchanges and transfers that are not reflected in the money price. Second, price underestimates the total value received because it neglects the consumer surplus generated.

[12] Some parents may have received benefits from the home visits in excess of the marginal value of their time, in which case the benefits from the program are underestimated. This estimate assumes that parents participated because they received immediate benefits (or long-term benefits not taken into account in this analysis, such as a better parent-child relationship) and not primarily because they anticipated that future benefits to the child (in school, etc.) would result. That assumption seems reasonable since parents were "sold" on participating in the home visits as a way to enjoy their children and not as a way to learn to improve their parenting skills.

[13] Eighty percent of the mothers and 50 percent of the fathers were not employed outside the home. In addition, 50 percent of the families were receiving welfare assistance. Finally, it must be considered that home visits would have allowed parents to simultaneously engage in other activities such as caring for children, socializing, and food preparation. Even if the minimum wage was used to estimate the cost of home visits, the result would be changed by only a fraction of the value of child care provided.

[14] The slight differences between waves in each year are accounted for by differences in screening costs. In the first year, screening costs are spread over more children for Wave Zero than for Wave One. In subsequent years only the later wave has a screening cost (e.g., there is no screening cost for Wave One the second year).

[15] The cost of the teachers alone accounts for about 80 percent of cost per child. Thus, even if all other costs were 50 percent lower than estimated, the overall cost per child would be only 10 percent lower.

[16] Neither do they have any claim to being the optimal level of costs.

CHAPTER 2

EDUCATION

Data on Educational Costs

The collection and format of data were both designed to delineate the effects of the preschool program on later school costs. Thus, individual educational histories were constructed for each participant that classified each year of schooling into one of several cost categories. These cost categories correspond to differences in costs between receiving general education (with no special services) and receiving special educational services instead of or in addition to general education. These special services are a response to educational difficulties, and are expected to be reduced as a result of the preschool program. Data for the individual educational histories were obtained primarily from participants' official school records, supplemented by age-15 and age-19 interviews.[1]

Histories were constructed only for the 112 participants whose school records could be obtained, even though some additional information may have been available through other sources.[2, 3] Even with the study limited to those with school records, it was in some cases difficult to determine whether special services were received in particular years. When receipt of special services was uncertain and could not be confirmed from other sources, it was assumed not to have occurred. As school records were sometimes incomplete and receipt of special services not recorded, the procedure used to construct the educational histories tends to undercount special services. This probably biased downward the estimated reduction in educational costs resulting from the preschool program.

The costs by year for each category of service (with one exception to be explained later) were estimated using budget, staffing, and attendance data from a single school district, Ypsilanti. All of the participants lived in the Ypsilanti district when they were selected for the study, and 80 percent of all years of schooling took place in this district. Another 15 percent of schooling took place in three adjacent districts--Ann Arbor, Van Buren, and Willow Run. The remaining 5 percent was scattered among five other Michigan school districts and two out-of-state districts.[4] The budget and other data that could be obtained for even the three adjacent districts were insufficient to provide detailed cost estimates for more than a few years. The greater availability of data for Ypsilanti was due in part to the preservation of data collected for an earlier economic analysis of the Perry Preschool program (Weber, Foster, & Weikart, 1978) and in part to the extraordinary efforts of present and former Ypsilanti school district personnel to provide information.

Method of Estimating Educational Savings

Cost estimates were produced for each school year from 1963-64 to 1979-80 for each of the following program categories:

1. **General education** - the "normal" educational program in an ordinary class with no extra educational services on a regular basis
2. **Special classroom special education** - often referred to as "self-contained" special education, a program where more than 50 percent of the child's time in school is spent in a special class for those with educational handicaps
3. **Integrated special education** - involving a "teacher-consultant," "helping teacher," or "crisis teacher," a program where more than 50 percent of the child's time in school is spent in an ordinary class
4. **Speech-and-language support** - in addition to an ordinary class, regular therapy for speech/language difficulties
5. **Compensatory education** - in addition to an ordinary class, remedial reading and/or math instruction
6. **Disciplinary education** - placement in an alternative public school setting as a result of delinquent behavior
7. **Special school** - placement outside the ordinary school system to provide more intensive services on either a daytime or residential basis

These categories were formulated to capture differences in cost among educational programs, and so do not correspond exactly to categories that would be drawn based on type of educational handicap or other educational difficulty. There is, however, some correspondence. Children who are classified as "educationally mentally impaired" (EMI), "emotionally impaired" (EI), or "learning disabled" (LD) may be assigned to either a special classroom or integrated special education program. The speech and language programs, and compensatory programs, deal with less severe impairments, and are at face value more impairment-specific.[5] The disciplinary program category is quite problem-specific, although the characteristics of the actual programs provided to these students have varied. Finally, special school placement appears to be most frequently associated with more severe behavioral problems.[6]

These cost categories are sufficient to capture most of the cost differences between regular and special education programs, but some of the additional costs are omitted. One such cost is that of the additional psychological testing received by students who are considered for special education placement. A cost for psychological testing was added to the cost of a participant's school year whenever the school record indicated testing or when a participant who was not in a special classroom, integrated special education, or a special school program was assigned to such a program the following year. Other costs remain uncounted, however, because there is no way to estimate them from the available data.[7] Probably the most important uncounted cost is the extra teacher time that "problem children" receive in ordinary classes. Another uncounted cost is the cost that disruptive children impose on other children in their classroom.[8] Indeed, the magnitude of these costs is one reason some children are completely removed from the regular classroom.

A single general procedure (involving a set of assumptions) was used to calculate costs for the program categories for each year from 1963-64 to 1979-80. This general procedure is composed of the following steps:

1. School district costs were separated into operating costs and capital costs.

2. Operating costs were separated into instructional and noninstructional costs.

3. Noninstructional costs were divided by the number of full-time equivalent (FTE) students, yielding a figure for noninstructional cost per student.

4. Implicit interest and depreciation were calculated for school district fixed assets, and their total divided by the number of FTE students, yielding a figure for capital cost per student.[9]

5. Noninstructional cost per student and capital cost per student were added to yield a figure called "overhead" per student.

6. Instructional costs were allocated to each of the public school cost categories (special school costs are calculated separately) as indicated by the school district's budget and staffing (e.g., four teachers for special classrooms, five for integrated). Instructional cost for each category was divided by number of FTE students to yield instructional cost per student.

7. The additional cost of administration and support services (except for psychological testing) was allocated to students in the special classroom, integrated, and speech and language programs. Total special education administration and support service cost was divided by total special education FTE to yield a special education overhead per student.

8. **General education** cost per student was calculated as the sum of overhead per student and general education instructional cost per student.

9. **Special classroom** cost per student was calculated as the sum of overhead per student, special education overhead per student, and special class instructional cost per student for early years when all instructional time was in special class. For later years, when some instructional time was spent in regular class, a weighted average of full-time equivalent special class cost and regular class cost was calculated.

10. **Integrated special education** cost was calculated first on a full-time equivalent basis as the sum of overhead, special education overhead, and integrated special education instructional costs. A weighted average of full-time equivalent integrated and general education costs was calculated on the basis of the percent of time spent in regular class.

11. **Speech and language support** cost was calculated in the same way as integrated special education cost, using the appropriate instructional cost figure.

12. **Compensatory education** cost per FTE student was calculated as the sum of overhead and compensatory education instructional costs per FTE student. The cost per child for those in the compensatory education category was calculated as the weighted average of FTE compensatory and general education costs, based on the percent of time spent in regular class.

13. **Disciplinary education** cost per FTE student was calculated as the sum of overhead and disciplinary education instructional costs per student. Again, for years when this program was not full-time, a weighted average with general education cost was calculated.

14. **Special school** costs were calculated on an individual basis for each school and year, based on specific cost estimates. In most cases, actual cost figures were readily available because there were established rates that these schools charged the state.

In addition to the above cost categories a cost was calculated for psychological evaluations. This was done, rather than simply including school psychologists in special education overhead, because a significant amount of their time was spent evaluating students who were not placed in special education programs. The cost of a psychological evaluation was estimated by dividing the psychologist's salary and benefits total by 135, the estimated number of evaluations performed per year.[10]

Not all the data needed for the procedure of estimating costs for each program category were available for every year. As might be expected, the earlier the year, the more scarce the appropriate data. General education costs (no special services) could be calculated by the procedure described above for every year, based on official data for each year. Costs could be calculated for the other public school program categories for most years, based on official data supplemented by personal recollections of school personnel regarding the student-teacher ratios (or relative amount of instruction per student) in each program category. The procedure was used to calculate costs for special classroom and compensatory programs from 1969-70 to 1979-80, for integrated and speech and language support programs from 1970-71 to 1979-80, and for disciplinary programs from 1969-70 to 1976-77. In the remaining years, school district budget data were insufficiently detailed to calculate costs. Instead, costs were estimated for these years, based on regression equations for the relationship of general education costs to other program category costs in years of more complete data. Table 14 presents only those costs calculated from individual program data. Table 15 presents the full set of costs, including those estimated from the data in Table 14. The cost figures estimated by regression analysis enter into

Table 14

EDUCATION COSTS PER CHILD-YEAR BY PROGRAM CATEGORY (CONSTANT 1981 DOLLARS)

Year	General Classroom	Special Classroom	Integrated Special Education	Speech-&-Language Support	Compensatory Education	Disciplinary Education
1979-80	$3,378	$4,670	$4,575	$3,734	$3,776	
1978-79	3,075	4,101	4,163	3,395	3,504	
1977-78	3,144	4,147	4,111	3,559	3,525	
1976-77	2,914	4,365	3,907	3,658	3,264	$4,341
1975-76	2,824	4,073	4,075	3,231	2,999	3,687
1974-75	2,856	3,816	4,506	3,240	2,920	4,323
1973-74	2,779	3,608	4,247	3,080	2,846	3,559
1972-73	2,464	3,120	3,670	2,795	2,539	3,273
1971-72	2,155	3,264	4,267	2,564	2,256	2,932
1970-71	2,025	2,919	2,994	2,379	2,068	2,143
1969-70	2,196	3,359			2,279	2,900
1968-69	2,263					
1967-68	2,101					
1966-67	1,920					
1965-66	1,853					
1964-65	1,711					
1963-64	1,653					

the benefit-cost analysis less frequently than do those calculated directly from official data, because special program placement tends to occur in the later years of schooling. This is especially true of the disciplinary program, where the estimates for the early and also the most recent years were rarely used.[11]

With costs for each program category by year, it was relatively simple to estimate each year's cost of education for each participant. The costs were mapped onto the individual educational histories that indicate program category, and psychological evaluation (if any), for each year. As stated previously, special school costs were estimated on a case-by-case basis. When more than one program category was indicated simultaneously (e.g., special classroom for EMI and a teacher-consultant for EI) the costs were calculated assuming that the amount of service in each special program did not differ from the average amount received by students who were only in a single program.[12] In a few cases, the assignment of costs was complicated because records did not clearly indicate whether the student received special classroom or integrated special education. In these cases, the mean cost for the two categories was assigned.

Table 15

EDUCATION COSTS PER CHILD-YEAR INCLUDING ESTIMATED YEARS
(CONSTANT 1981 DOLLARS)

Year	General Education	Special Classroom	Integrated Special Education	Speech-&-Language Support	Compensatory Education	Disciplinary Education
1979-80	$3,378	$4,670	$4,575	$3,734	$3,776	$4,574
1978-79	3,075	4,101	4,163	3,395	3,504	4,164
1977-78	3,144	4,147	4,111	3,559	3,525	4,257
1976-77	2,914	4,365	3,907	3,658	3,264	4,341
1975-76	2,824	4,073	4,075	3,231	2,999	3,687
1974-75	2,856	3,816	4,506	3,240	2,920	4,323
1973-74	2,779	3,608	4,247	3,080	2,846	3,559
1972-73	2,464	3,120	3,670	2,795	2,539	3,273
1971-72	2,155	3,264	4,267	2,564	2,256	2,932
1970-71	2,025	2,919	2,994	2,379	2,068	2,143
1969-70	2,196	3,359	3,654	2,581	2,279	2,900
1968-69	2,263	3,247	3,701	2,650	2,439	3,065
1967-68	2,101	3,058	3,587	2,482	2,264	2,845
1966-67	1,920	2,847	3,460	2,296	2,069	2,600
1965-66	1,853	2,769	3,412	2,227	1,997	2,509
1964-65	1,711	2,604	3,312	2,080	1,844	2,317
1963-64	1,653	2,536	3,272	2,021	1,781	2,239

Results on Educational Savings

The effect of the Perry Preschool program on elementary and secondary education costs was estimated from the 112 individual educational cost histories by the method of ordinary least squares (OLS). Cumulative cost is the dependent variable and preschool attendance (yes/no) is the independent variable. The results of this estimation are presented in Table 16 for the group as a whole and in Tables 17 and 18 for males and females separately.[13] Equations were estimated for undiscounted educational costs, and for costs discounted at real rates of 3, 5, and 7 percent, and over periods reflecting one and two years of preschool attendance. The preschool program reduced undiscounted education costs by an estimated $7,082, from an average of $41,895 to $34,813.

The most important of the several sources of reduction in education costs is the preschool program group's significantly lower rate of placement in programs for educable mentally impaired students. Also contributing to the cost reduction are differences in school success that favor the preschool program group but are not individually statistically significant: less grade repetition, less placement in disciplinary programs, and less placement in special schools. On the other side, there is one statistically significant difference that tends to increase educational cost for the group who attended preschool--their increased educational attainment. In other words, if education is viewed as a production process, the preschool program's effects on education show up both as cost reductions and output increases. One way to analyze the total effect on educational efficiency is to examine unit cost, in this case by estimating the preschool program's effect on average cost per year of educational attainment.

The effect on average cost per year of educational attainment was estimated by OLS for undiscounted and discounted costs. Cumulative cost divided by highest grade attained is the dependent variable and preschool attendance (yes/no) is the independent variable. The results are presented in Table 19. The preschool program reduced costs by $800 per year, from $3,930 to $3,130. Relative to cost, the estimated effect on cost per year attained is about 20 percent greater than the effect on total cost. When analyzing education costs in isolation this should be taken into account. For the benefit-cost analysis as a whole, only the reduction in total cost is considered, since the increase in output (educational attainment) will be taken into account in the estimates of lifetime earnings, which are expected to be higher for those with more education.

Table 16

BOYS AND GIRLS: ESTIMATED EFFECTS OF THE PERRY PRESCHOOL PROGRAM ON TOTAL COST (CONSTANT 1981 DOLLARS) OF ELEMENTARY AND SECONDARY EDUCATION (n=112)

Discounting Alternative	Estimated Effect	Significance Level[a]	R^2[b]
Undiscounted[c]	-$7,082.00	.121	.02
One year of preschool (discounted to age 4)			
3%	-$5,113.10	.115	.02
5%	-$4,147.90	.112	.02
7%	-$3,385.40	.109	.02
Two years of preschool (discounted to age 3)			
3%	-$4,964.10	.115	.02
5%	-$3,950.30	.112	.02
7%	-$3,163.90	.109	.02

[a] Two-tailed p-values are reported.

[b] R^2 is the proportion of variance in the effect accounted for by preschool versus no-preschool.

[c] The undiscounted financial benefits are the same for one and two years of preschool because the same estimates of effect are used for both.

Table 17

GIRLS ONLY: ESTIMATED EFFECTS OF THE PERRY PRESCHOOL PROGRAM ON COST (CONSTANT 1981 DOLLARS) OF ELEMENTARY AND SECONDARY EDUCATION (*n*=46)

Discounting Alternative	Estimated Effect	Significance Level[a]	R^2[b]
Undiscounted	-$3,824.00	.075	.07
One year of preschool (discounted to age 4)			
3%	-$2,840.80	.074	.07
5%	-$2,355.60	.073	.07
7%	-$1,969.40	.074	.07
Two years of preschool (discounted to age 3)			
3%	-$2,758.10	.074	.07
5%	-$2,243.40	.073	.07
7%	-$1,840.60	.073	.07

[a] Two-tailed *p*-values are reported.

[b] R^2 is the proportion of variance in the effect accounted for by preschool versus no-preschool.

Table 18

BOYS ONLY: ESTIMATED EFFECTS OF THE PERRY PRESCHOOL PROGRAM ON COST (CONSTANT 1981 DOLLARS) OF ELEMENTARY AND SECONDARY EDUCATION (*n*=66)

Discounting Alternative	Estimated Effect	Significance Level[a]	R^2[b]
Undiscounted	-$8,766.00	.251	.02
One year of preschool (discounted to age 4)			
3%	-$6,275.90	.247	.02
5%	-$5,057.20	.245	.02
7%	-$4,096.40	.245	.02
Two years of preschool (discounted to age 3)			
3%	-$4,816.40	.247	.02
5%	-$4,816.40	.245	.02
7%	-$3,828.50	.245	.02

[a] Two-tailed *p*-values are reported.

[b] R^2 is the proportion of variance in the effect accounted for by preschool versus no-preschool.

Table 19

ESTIMATED EFFECTS OF THE PERRY PRESCHOOL PROGRAM ON THE COST (CONSTANT 1981 DOLLARS) PER YEAR ATTAINED OF ELEMENTARY AND SECONDARY EDUCATION (n=112)

Discounting Alternative	Estimated Effect	Significance Level[a]	R^2[b]
Undiscounted	-$800.14	.075	.03
One year of preschool (discounted to age 4)			
3%	-$587.51	.070	.03
5%	-$482.43	.067	.03
7%	-$398.84	.064	.03
Two years of preschool (discounted to age 3)			
3%	-$570.40	.070	.03
5%	-$459.46	.067	.03
7%	-$372.75	.064	.03

[a] Two-tailed p-values are reported.

[b] R^2 is the proportion of variance in the effect accounted for by preschool versus no-preschool.

Footnotes

[1] Other sources of information include intelligence and achievement tests administered for the study (among the identifying information these tests request are school, grade of special education placement, and teacher), and a school placement record compiled by High/Scope staff in 1968.

[2] Two participants asked to be deleted from the study and are excluded. Other reasons for not obtaining school records include being denied access to records by school officials, despite the student's written consent and loss or misplacement of records by school officials. The latter accounts for most of the records not obtained. Between participants whose records were obtained and those whose records were not, no significant differences were found regarding treatment, gender, or IQ at entry.

[3] Educational attainment (e.g., high school graduation) was determined for 121 study participants. This information was not used to estimate costs where school records were unavailable but was used to estimate lifetime earnings.

[4] The percents in each district are shown below. Between those who did and did not attend preschool, there is no statistically significant difference in the percent of school years spent in the Ypsilanti district.

	% of School Years in District					
Participants:	Ypsilanti	Ann Arbor	Van Buren	Willow Run	Other Michigan	Out-of-State
Total sample	79.5	4.2	3.4	7.6	4.0	1.2
Preschool	77.5	4.0	6.9	6.7	3.1	1.7
No preschool	81.4	4.4	0.1	8.4	4.7	1.0

[5] Whether speech-and-language, and compensatory programs are in fact more impairment specific or simply deal with a wide range of mild impairments is unclear.

[6] Some participants were sentenced to correctional facilities. Generally, this was not considered to be a "special school" situation, and the participant was classified according to the type of program enrolled in while imprisoned.

[7] The extent of the underestimate is smaller than might at first be imagined. For example, PL 94-142 requires triennial meetings to evaluate and plan the educational program of each child in a special education placement. The cost of these meetings is not explicitly calculated. However, in calculating special education program costs, all of the administrative costs and teacher costs are accounted for, so that only the cost of the parents' time to attend the meeting is omitted from costs.

[8] Another potential source of underestimation of special education costs is the assumption that children should only be charged instructional costs for the time they spend in a specific placement. Thus, if a student spends 50 percent of the time in a regular class and 50 percent of the time in a special class, then the student's cost is calculated as the sum of 50 percent full-time equivalent cost for each. However, if the student's resulting absence from regular or special class 50 percent of the time results in idle resources in one or both classes, then this underestimates the student's true cost.

[9] The implicit interest and depreciation on school district capital were estimated using a depreciation rate of 3.7 percent and a variable interest rate. The depreciation rate is a weighted average based on the distribution of school district assets, as explained in Chapter 1 in the discussion of depreciation for the costs of the preschool program. The implicit rate of interest was estimated by the 20-bond-average Bond Buyer's Municipal Bond Yield.

[10] This estimate is based on the number of weekly evaluations estimated by Dr. David Weikart (the Ypsilanti Special Education Director at the time).

[11] The disciplinary program changed over time. Official program data were available from 1970-76, but the program began to be phased out after 1976-77. One participant appears to have been in the program in 1977-78.

[12] This is not simply adding the costs of two program categories together, which would double-count some costs. Instead, the full cost of one program is added to the marginal cost of the other over the cost of general education. This method provides an exact accounting of cost (under the assumption that the instructional time spent in each program is not different for those with multiple programs) when the average instructional time in both special programs combined is a full day or less, which is generally the case. It is theoretically possible for our assumption to be in error and a student to have been in multiple special programs where the average time combined would be more than a full day. In this case the method used provides an approximation that somewhat compensates for this, though costs are still slightly overestimated. The practical impact is judged to be negligible, given the relatively small amounts of time spent in special programs.

[13] Although separate regressions are presented by gender, in a single regression for all 112 cases, neither gender nor gender/treatment interaction is statistically significant at the 10 percent level. In this case, the estimator of the preschool program's effect provided by the regressions on both genders combined, with treatment the only independent variable, may be considered the best estimator of preschool program effect.

CHAPTER 3

HIGHER EDUCATION

Data on Higher Education Costs

Estimation of the costs of higher education made use of data on college attendance by age 19; expected educational attainment, given college entrance; and per-student costs of higher education. The age-19 interviews indicated whether an individual had entered college by age 19 and the name of the institution attended (in a few cases, more than one). Unpublished data from the 1980 Current Population Survey (1982) were obtained on years of college completed by black men and women aged 25-29. Data on per-student costs were obtained from two sources. The National Center for Educational Statistics provided data for Michigan and the United States as a whole, on fiscal year 1979 current funds expenditures per full-time equivalent (FTE) student by type of institution. National data on the value of physical property for institutions of higher education were obtained from the *Digest of Education Statistics* (Grant & Eiden, 1982, p. 105).

Method of Estimating Higher Education Costs

The probability of each level of higher educational attainment, given college entrance, was estimated using data from the 1980 Current Population Survey. First, estimates of educational attainment were obtained separately for black men and for black women who had completed at least one year of college, and these are presented in Table 20. These estimates may tend to underestimate final educational attainment because they are based on blacks aged 25-29, some of whom are likely to obtain additional schooling. Statistics for an older cohort were not used because cohort differences in educational attainment seem likely, with older cohorts having lower attainment.[1] Based on the estimates in Table 20, probabilities for completing each year of school were calculated, and these are presented in Table 21.[2]

Annual costs of higher education per full-time equivalent (FTE) student were calculated for Michigan and the nation as a whole. The essential calculations are presented in Table 22 for all institutions and for two- and four-year institutions separately. An estimate of implicit interest and depreciation on physical capital was added to current educational expenditure to produce a total cost estimate.[3] Estimated costs for public institutions in Michigan are slightly higher than national average costs.

Table 20

LEVEL OF EDUCATIONAL ATTAINMENT FOR U.S. BLACKS AGED 25-29 WITH AT LEAST ONE YEAR OF HIGHER EDUCATION

Number of Years Higher Education	% of Men	% of Women
1	25.0	27.0
2	28.3	24.4
3	14.8	10.1
4	23.2	29.3
5+	8.7	9.3

Table 21

PERCENT PROBABILITY OF U.S. BLACKS COMPLETING EACH YEAR OF HIGHER EDUCATION

Number of Years Higher Education	Men	Women
1	100.0%	100.0%
2	75.0	73.1
3	46.7	48.7
4	31.9	38.6
5+	8.7	9.3

An expected college cost was estimated for each year based on the estimated annual cost per FTE student and the estimated probability of completing each year of higher education.[4] Annual cost per FTE for the first two years was estimated by a weighted average of the costs of two- and four-year institutions that reflects actual attendance by the sample—$5,321. Subsequent annual cost per FTE was estimated by the cost of four-year institutions. There was no information regarding the probability of completing more than five years of higher education. Thus, it was somewhat arbitrarily assumed that half of those completing five years completed an additional year. No further extrapolation was made in view of the relatively small numbers involved. The resulting expected cost-per-year figures are presented in Table 23.

Estimates of the total costs of higher education for men and women were obtained by discounting the figures in Table 22 and summing across the years. To discount properly, those who attended college were divided into two groups: a group entering college in the year of high school graduation and a group entering college the year following graduation. An estimated higher education cost was then assigned to each individual who attended college, based on year of entry and gender.

Table 22

ESTIMATED COST OF HIGHER EDUCATION

Category	All Institutions	Public Four-Year Institution	Public Two-Year Institution
U.S.			
Current expenditures	$4,771	$6,428	$2,519
Implicit interest & depreciation	426	426	426
Total in current dollars	$5,197	$6,854	$2,945
Total in constant 1981 dollars	$6,232	$8,218	$3,531
Michigan			
Current expenditures	$4,625	$7,801	$2,658
Implicit interest & depreciation	426	426	426
Total in current dollars	$5,051	$8,227	$3,084
Total in constant 1981 dollars	$6,057	$9,865	$3,698

Findings for Higher Education Costs

The effect of preschool on costs of higher education was estimated by a simple two-group comparison. Estimates at the different discount rates are presented in Table 24. The estimated effect is not statistically significant, nor was it expected to be. There is no significant preschool effect on college attendance alone. However, preschool does have a significant effect on all post-secondary education (including vocational programs). Unfortunately, there are no data sets that can be used to estimate either the total costs of vocational education (and expected number of years in vocational programs) or the effects of vocational education on lifetime earnings. Moreover, preschool has a significant effect on overall academic educational attainment (including college and noncollege) and this effect is used to estimate preschool's effect on lifetime earnings. With the benefits of college education included in the analysis, it seemed correct to include the costs as well, despite the lack of statistical significance when college attendance is considered in isolation.

Table 23

ESTIMATION OF EXPECTED COST OF HIGHER EDUCATION (CONSTANT 1981 DOLLARS)

	Men			Women		
Years of Higher Education	Probability	Cost/ FTE	Expected Cost	Probability	Cost/ FTE	Expected Cost
1	1.00	$5,321	$5,321	1.00	$5,321	$5,321
2	0.75	5,321	3,991	0.72	5,321	3,831
3	0.47	9,865	4,637	0.48	9,865	4,735
4	0.32	9,865	3,157	0.39	9,865	3,847
5	0.09	9,865	888	0.09	9,865	888
6 (assumed)	0.045	9,865	444	0.045	9,865	444

Table 24

ESTIMATED PRESCHOOL EFFECT ON COST OF HIGHER EDUCATION (CONSTANT 1981 DOLLARS)

Discounting Alternative	Preschool Effect
Undiscounted[a]	$1,168
One Year of Preschool (discounted to age 4)	
3%	$ 704
5%	502
7%	367
Two years of preschool (discounted to age 3)	
3%	$ 684
5%	483
7%	343

[a] The same estimates of effect are used for one year of preschool and two years of preschool. Therefore the undiscounted financial benefits are the same for one and two years of preschool.

Footnotes

[1] The potential magnitude of the bias introduced by use of data for the age 25 to 29 cohort is presumed to be relatively small. The use of the data for this cohort does not affect the estimate of the rate of college entrance, but only the estimate of the dropout rate. The age 20 to 25 cohort could not be used because too many of these were still continuing their educations. From the data for the age 25 to 29 cohort, one would estimate that 36 percent of blacks who enter college will eventually graduate (a weighted average for men and women). No better estimate of the percent of black college freshmen who eventually graduate could be obtained.

[2] Data on college attendance were collected at age 19. This allowed us to observe that 16 of the 19 study participants reporting some college attendance had completed (or nearly completed) at least one year of college. Thus, the statistics used to estimate ultimate attainment (Table 20) are for blacks who had completed at least one year of college.

[3] The estimate of implicit interest and depreciation is based on the following: an assumed rate of 4% for depreciation and of 3.5% for implicit interest; of a value for college and university physical property of $7,237 per student (in 1979 dollars); and a 78.535% share of college and university resources used for educational purposes (including research, public service, and libraries).

[4] Use of cost per FTE introduces a very slight upward bias, as some students are part-time (3 of 19). The bias is not as great as the difference between part-time and full-time cost per year, however. The half-time student, for example, takes two years to attain one year and simply spreads the cost of one year over a longer period; discounted costs are slightly less as a result.

CHAPTER 4

CRIME AND DELINQUENCY

Data on Crime and Delinquency Costs

The data used to estimate the benefits from reduced crime and delinquency are from an offense cost history calculated for each study participant. Three types of data are required to construct these histories: data on the offenses committed--date of occurrence, type of offense, and disposition of case by the criminal justice system; data on the social costs incurred by victims; and data on the criminal justice system costs of offenses.

There were two potential sources of data on offenses--interview responses, and official police and court records. At ages 15 and 19 participants were asked about the frequency of criminal and delinquent offenses and of involvement with the police. These self-report data provide responses that are too imprecise for use in constructing individual's cost histories, however. As an alternative, data on offenses for which participants had been arrested were collected from criminal justice agencies.[1] These data more severely underrepresent actual offenses committed than do the self-report data, but they provide much more detail about each offense. Moreover, two other considerations limit the importance of the undercount: (1) the most readily quantified cost of crime is the criminal justice system cost, which applies only when there is an arrest, and (2) the total number of offenses committed can be estimated from the number of arrests.

Data collection differed substantially between juveniles and adults, primarily because the criminal justice system deals with them differently. Data on adults were obtained from a single state police database. Data on juvenile arrests had to be obtained from each jurisdiction in which an offense might have occurred. The jurisdictions to be contacted were determined on the basis of place of participant's residence and interview responses regarding place of police involvement. The arrest data were collected subsequent to the age-19 interview, at a time when the youngest wave (Wave Four) had reached age 20 and the oldest (Wave Zero) had reached age 24. For the cost analysis the offense histories were limited to age 20 for all waves.

Victim cost estimates are based on criminal incident data from the 1977 National Crime Survey (U.S. Department of Justice, 1979), a household survey of victimization. The cost data were adjusted for inflation to 1981, using the implicit GNP price deflator. These data provide information on categories of victim cost according to type of crime. The cost categories are the following: property damage, medical care, insurance, lost output from work missed, and stolen property. The 1977 survey data refer to incidents that occurred in 1976, and their usefulness depends in part on the assumption that the real costs of crimes did not vary much over the relevant period.

Criminal justice system (CJS) costs were estimated for juvenile and adult arrests separately. Data on the costs of arrest, court proceedings, and detention were obtained from the Ypsilanti Police Department and Washtenaw County Juvenile Court. These were the agencies that incurred most of the juvenile CJS costs. Arrest cost estimates were based on police descriptions of typical arrest procedures and the personnel involved in these, and city of Ypsilanti audit and budget data for the police department. Court cost estimates were based on data from the Washtenaw County Juvenile Court's budgets and annual reports. Data on the costs of juvenile detention were obtained from the Juvenile Court's annual reports and from state reports on the costs of correctional facilities, for each facility where a participant was placed. Adult criminal justice system costs were estimated by type of crime using a procedure developed by staff of Mathematica Policy Research, Inc. (Mallar et al., 1978; Thornton, Long, & Mallar, 1979) and national criminal justice system expenditure data (U.S. Department of Justice, 1981). A notable shortcoming in the data for both juvenile and adult criminal justice system costs is the lack of information regarding the value of fixed assets.

Method of Estimating Crime and Delinquency Savings

The process used to estimate the effects of the preschool program on the costs of crime can be divided into seven steps, each of which will be described in detail. Briefly, the seven steps are these:

1. Construct individuals' arrest histories.
2. Estimate victim costs for each type of crime.
3. Estimate juvenile justice system costs by degree of involvement with the system.
4. Estimate adult justice system costs for each type of crime.
5. Map the cost estimates onto the arrest histories.
6. Estimate the effect of the preschool program.
7. Extrapolate the effect for crime costs over a lifetime.

For each participant an arrest history was constructed that specifies the following for each arrest: age at arrest, most serious offense charged, and final disposition of the charge.[2, 3] For adult arrests, disposition has no implications for arrest cost estimates, given the limitations of the CJS cost data, and will not be considered further. For juvenile arrests, disposition is classified into four categories that represent the degree of penetration into the juvenile justice system: offender warned and released by the police department; charges filed or petition requested for a court hearing, but request denied by the court; petition issued for a court hearing, but hearing not resulting in detention; and offender sentenced to a detention facility.

Victim costs were estimated for each type of crime specified in the individual arrest histories. These are presented in Table 25. The estimates are based on cost estimates developed by Thornton et al. (1979) with criminal incident data from the 1977 National Crime Survey (U.S. Department of Justice, 1979).[4] They calculated the social cost of victimization as the sum of five component costs: property damage, medical care, insurance, work loss, and stolen property. Except for stolen property cost, the estimated component costs are adopted with no changes for this analysis, and a brief discussion of their estimation is provided. Property damage per crime was estimated by multiplying the percent of all victims incurring some damage by the average value of loss for those who incurred a property damage loss. Similarly, medical cost was estimated from average cost for those who incurred some medical cost. For insurance payments, only administrative cost was included in the estimate of social cost; the remainder is considered a transfer payment. Administrative costs were estimated to be 5 percent of claims paid for medical insurance, and 28 percent, for property insurance. Cost of lost output was estimated by multiplying the average hours of victims' work loss by the average hourly gross compensation in the nongovernment sector of the economy.

Our analysis departs from Thornton et al. (1979) in estimating the social cost of stolen property. To some extent theft is a transfer of property from one person to another, and the social cost of theft is less than the value of the property stolen. If the transfer were complete there would be no net economic cost to society. The transfer is incomplete, however, because the thief incurs costs to obtain the property and often does not receive the entire value of the property. Costs of obtaining the property include resources expended and risk of injury and incarceration. Loss of value results from damage in theft, loss of legal title, and costs of fencing property. Thornton et al. (1979) assume that 65 percent of value is lost in burglary and robbery, while no value is lost (zero social cost) in larceny, based on very limited data from a study by McGlothlin, Tabbosh, Chambers, and Jamison (1972). However, other data provide very similar estimates (Sesnowitz, 1972). In the present analysis it is assumed that social cost equals the value of stolen property. There are three basic reasons for this assumption. One, the theoretical arguments just mentioned suggest that social cost is a relatively large fraction of the value of stolen property. Two, the victim cost estimates tend to be underestimates, and it seems prudent to avoid introducing additional downward bias. Three, if this assumption seems extreme its effects can be considered by omitting victim costs altogether (i.e., assuming that social cost is zero). As will be seen, including or omitting the victim cost estimates makes relatively little difference because in so far as we have been able to measure them these are small relative to criminal justice system costs.

Juvenile justice system costs were estimated in three parts: police costs, juvenile court costs, and juvenile detention costs. According to interviews with Ypsilanti Police Department personnel, juvenile arrests require between one and four hours of personnel time. To take this into account two arrest cost estimates were calculated--a one-hour "petty arrest" cost, and a four-hour "serious arrest" cost. The one-hour cost is calculated as the cost of one hour of patrol officer time. The four-hour cost is calculated as the sum of one hour of patrol officer time and three hours of office staff time.[5] Estimated costs for each year are presented in Table 26, in current year and constant 1981 dollars. Mean costs were calculated from the constant dollar figures.

Table 25

ESTIMATED VICTIM COSTS

	1977 DOLLARS				1981 $
Crime	Property Damage, Medical Care, & Insurance Cost	Cost of Lost Output	Value of Stolen Property	Total Victim Cost	Total Victim Cost
Homicide	$538[d]	$100,000	$ 0	$100,538	$140,389
Robbery	46	28	96	170	237
Felonious assault	67	29	0	96	134
Burglary	31	5	241	277	387
Larceny/auto theft	17	3	97	117	163
Narcotics[a]	0	0	0	0	0
Other personal crimes	9	9	0	18	25
Other miscellaneous[b]	0	0	0	0	0
Unspecified crimes[c]	9	3	36	47	66

Note. Adapted from "A comparative evaluation of the benefits and costs of the Job Corps after seven months of postprogram follow-up" (Report No. 10) by C. Thornton, D. Long, and C. Mallar, 1979, in *Assessments of the Job Corps performance and impacts*, *Vol. 1*, Washington, DC: U.S. Department of Labor.

[a] Possession of marijuana is the only type of narcotics arrest that occurred in the Perry sample. Thus, this cost assumption is more plausible than it might be more generally.

[b] "Victimless" crimes.

[c] Weighted average of other categories.

[d] No insurance cost included.

Table 26

JUVENILE ARREST COSTS

	4-hour		1-hour	
Year	Current Dollars	Constant 1981 Dollars	Current Dollars	Constant 1981 Dollars
1978-79	$89.68	$107.53	$21.51	$25.79
1977-78	83.71	109.19	21.27	27.74
1976-77	74.34	104.36	20.10	28.22
1975-76	74.45	112.07	17.81	26.81
1974-75	66.61	107.20	15.22	24.49
1973-74	52.81	93.22	14.77	26.07
1972-73	52.03	101.26	13.60	26.47
1971-72	47.53	99.02	12.40	25.83
1970-71	39.05	85.83	12.38	27.21
1969-70	30.17	70.95	10.04	23.61
Mean	-	$ 99.00	-	$26.00

Juvenile court costs were estimated from the court's budget data excluding detention facility costs. The proportion of the court's budget spent on delinquency offenses was estimated by the proportion of total hearings accounted for by delinquency hearings.[6] This "delinquency budget" was divided by the delinquency caseload to yield a cost per case.[7] Estimated costs per case for each year are presented in Table 27, in current and constant 1981 dollars. The average constant dollar cost per case was about $648.

Juvenile detention costs were estimated for temporary and long-term placements. Temporary detention cost was estimated by average cost per admission over the years 1973 to 1979, presented in Table 28. Average temporary detention cost was $2,435 per admission, in constant 1981 dollars, and average length of stay, about one month.[8] Long-term placements were much less frequent than temporary detentions and varied considerably in type of facility. For long-term placement, costs were estimated for each admission in the sample, based on specific information on length of placement and facility cost.

Adult criminal justice system (CJS) costs were estimated using a procedure developed by Thornton et al. (1979). In this procedure estimates of the CJS costs by type of crime, calculated for Baltimore in 1974, are used to estimate the ratios of costs for specific types of crime to the average cost across all types. A national average CJS cost for 1978 (the latest year with available data) was calculated by dividing the year's total

CJS expenditures by the total arrests.[9] This average was adjusted for inflation to 1981 dollars using the implicit GNP price deflator for state and local government purchases of goods and services. CJS costs for each type of crime were estimated by multiplying the national average cost by the ratios. These cost estimates are presented in Table 29.[10]

Table 27

JUVENILE COURT COSTS PER CASE BY YEAR

Year	Current Dollars	Constant 1981 Dollars
1969	$194.22	$493.55
1970	326.25	767.27
1971	286.19	629.01
1972	304.47	634.22
1973	294.14	572.47
1974	328.66	580.15
1975	368.33	592.77
1976	497.02	748.13
1977	473.63	664.87
1978	580.69	757.46
1979	470.32	683.86
Mean	-	$647.61

Table 28

TEMPORARY DETENTION COSTS PER ADMISSION BY YEAR

Year	Current Dollars	Constant 1981 Dollars
1973	$1,304.85	$2,539.58
1974	1,379.87	2,435.75
1975	1,671.81	2,690.53
1976	1,412.12	2,125.58
1977	1,448.73	2,033.69
1978	2,091.12	2,727.69
1979	2,077.61	2,491.22
Mean	-	$2,434.86

Table 29

ESTIMATED CRIMINAL JUSTICE SYSTEM
COSTS FOR ADULT ARRESTS (CONSTANT 1981 DOLLARS)

Type of Crime	CJS Cost
Murder	$39,168
Robbery	19,115
Felonious assault	4,321
Burglary	9,323
Larceny/auto theft	4,140
Narcotics	4,096
Other personal	1,196
Other miscellaneous	1,453

The victim costs, juvenile justice costs, and adult justice costs were all mapped onto the individual arrest histories. As the crime-type categories for costs are more general than those used in the arrest histories, the transition to the more general categories is shown in Table 30. Attempted crimes are treated as completed crimes of the same type, except for attempted murder, which is treated as an assault. This is consistent with the treatment of attempted crimes in the victimization survey that is the source of the cost data used in this analysis. Arson, a crime for which cost estimates were unavailable, is treated as a burglary for cost purposes; this probably underestimates its cost. Rape is treated as a felonious assault.[11] The information in Table 30 is sufficient to map victim costs (Table 25) and adult criminal justice costs (Table 29) onto the arrest histories. Mapping juvenile justice costs onto the arrest histories was more complicated.

The victim cost estimates derived from the 1977 National Crime Survey (U.S. Department of Justice, 1979) data are likely to underestimate actual victim costs. (Several sources of underestimation are discussed in Footnote 13.) In general, we make no correction for this underestimation. However, for some of the most serious crimes, the estimates seemed so unreasonably low that we substituted arbitrarily higher (but plausible) cost estimates in a second set of analyses. Comparison of results showed that the use of higher cost estimates had no substantive effect on the estimated preschool effect on crime costs. This is probably because the most serious crimes occurred relatively infrequently and so have little weight and because estimated victim costs remained small relative to criminal justice system costs. Since any adjustments would have been somewhat artibrary and made no real difference, we continued to use the original estimates.

Table 30

CATEGORIZATION OF ARRESTS FOR COST ESTIMATION

Juvenile Offenses

Burglary

Arson (1 at 14, 1 at <16)
Attempted breaking and entering (1 at 15)
Breaking and entering (1 at 11, 1 at 13, 1 at 14, 2 at 15, 3 at 16, 2 at 17, 1 at <18)

Felonious Assault

Aggravated assault (1 at 16)
Assault and battery (1 at 14, 1 at <16, 1 at 17)
Assault with intent to rape (1 at 15)
Felonious assault (1 at 16)
Rape (1 at 17)

Larceny

Attempted larceny (1 at 13)
Attempted larceny from a building (1 at 14)
Joyriding (1 at 17)
Larceny (1 at 11, 1 at 14, 1 at 15)
Larceny from a building (1 at 13, 1 at 14, 3 at 15, 2 at 16, 1 at 17)
Larceny from a person (1 at 14)
Shoplifting (1 at 10, 1 at 15)

Robbery

Armed robbery (1 at 14)

No-Cost

Attempted armed robbery (1 at 16)
Destroying property (1 at 16)
Minor in possession of alcohol (1 at 16)
Obstructing police (1 at 14)
Pick up order (1 at 13, 1 at 16)
Possession of marijuana (1 at 16)
Possession of stolen auto (1 at 13, 1 at 16)
Possession of stolen property (1 at 14)
Receiving stolen property over $100 (1 at 15)
Runaway (1 at 12, 1 at 15, 1 at <16)
Trespassing (1 at 15)
Truant (3 at 14, 1 at 15, 1 at 16)
Unlawfully driving away an auto (1 at 16)

(continued)

Table 30 (continued)

Adult Offenses

Burglary

Attempted burglary (1 at 19)
Burglary (3 at 18, 2 at 19)
Breaking and entering (1 at 18)

Felonious Assault

Assault (1 at 17, 1 at 18)
Assault and battery (1 at <19, 3 at 20)
Assault with intent to commit great bodily harm (1 at 20)
Assault with intent to murder (1 at 18)
Attempted homicide (1 at 18)
Felonious assault (2 at 19, 1 at 20)
Rape (1 at 17)

Larceny

Attempted larceny from a building (1 at 17)
Larceny (2 at 18)
Larceny from a person (1 at 20)
Larceny under $100 (1 at 17, 1 at 20)
Unlawfully driving away an auto (1 at 18)

Robbery

Armed robbery (1 at 17, 1 at 18, 1 at 19, 1 at 20)
Unarmed robbery (1 at 17)

No Cost ("Other Miscellaneous" unless otherwise noted)

Carrying concealed weapon (1 at 17, 1 at 20) (unspecified)
Contempt (2 at 18, 2 at 19)
Destruction of property (1 at 18)
Disturbing the peace (1 at 18)
Driving with a revoked license (1 at 19)
Escapee (2 at 20)
Failure to appear in court (1 at 19, 1 at 20)
False report to police (1 at 19, 1 at 20)
Fugitive (1 at 17, 1 at 18, 1 at 19, 1 at 20)
No driver's license (1 at 17)
Homicide (1 at 19) (excluded)
Perjury (1 at 20)
Pick up order (1 at 18)
Possession of marijuana (2 at 18, 1 at 19, 1 at 20)
Possession of marijuana with intent to sell (1 at 20)
Possession of stolen property over $100 (1 at 20)
Possession of stolen property under $100 (1 at 19)
Probation violation (1 at 18)
Receiving stolen property over $100 (1 at 20)
Third degree criminal sexual conduct (1 at 20)
Traffic violation (1 at <18)
Trespassing (1 at 18, 1 at 20)

Note. The offense category for cost estimation is underlined, followed by the official offense and, in parentheses, the number of offenses and the age at offense.

The assignment of juvenile justice costs depends primarily on degree of involvement with the legal system, and only secondarily on type of offense. When the incident was victimless (or if it was a larceny under $100), and when no charges were filed and no petition requested, a "petty arrest" cost was assigned. When the incident involved over $100, personal violence, filing of formal charges, or a police request of a petition for a court hearing, a "serious arrest" cost was assigned. When the record indicated a temporary detention or long-term placement, a temporary detention cost was assigned. Finally, a specific cost was calculated and assigned for each long-term placement, such as sentencing to a boys' training school.

The mapping of cost data onto arrest histories produces individual crime cost histories that contain the basic information used to estimate the preschool program's effect on crime costs. However, each year's costs must first be discounted. After discounting, costs are summed across years to provide a single cost figure for each individual. The effect of the preschool program on these cost figures is assessed by estimating an ordinary least squares (OLS) equation in which cost is the dependent variable and preschool program participation and gender are the independent variables. Gender is introduced as an independent variable because of the relative over-representation of males in the group that did not attend preschool and the association between gender and crime. This procedure provides estimates of the effects of the preschool program on the present value of the cost of crimes that resulted in arrests through age 20. More complete estimates of the preschool program's effects on crime require that extrapolations be performed.

Two types of extrapolations are needed to move from the estimated costs of arrests through age 20 to an estimated cost for all crime. One is the extrapolation of victim costs for all crimes, based on the ratio of total offenses committed to arrests. Thornton et al. (1979) provide estimates of the frequency of crimes relative to arrests (by type of crime) that vary from about 5 for felonious assault to over 20 for larceny/auto theft, with the average being about 15. For this analysis, to examine the potential size of victim costs for all crime, victim costs are estimated assuming 5, 15, or 20 crimes per arrest.

The other extrapolation is for crime costs beyond age 20. Data from Uniform Crime Reports (U.S. Department of Justice, 1980, pp. 200-201) provide some information on the pattern of arrests by age that can be used in developing a reasonable extrapolation procedure for crime after age 20. Data on arrests by age are commonly used to estimate the amount of crime committed by age (e.g., Gibbons, 1968; Guttridge, Gabrielli, Mednick, & Van Dusen, 1983), and we use this procedure here. The percent of persons arrested in each age category is presented in Table 31. A simple extrapolation was adopted that closely corresponds to these data. It is assumed that crime cost for the five years from age 21 through age 25 was constant at the level of average cost for ages 18 to 20. Cost declines by one half, in a step function, for every 10-year period thereafter to age 65. There is no cost after age 65.

Table 31

1979 U.S. ARRESTS BY AGE CATEGORY

	Age							
Percent	Under 18	18-20	21-24	25-34	35-44	45-54	55-64	65+
Total % in category	20.9	17.5	17.9	23.7	10.3	6.0	3.0	1.0
Average % per year for category	-	5.8	4.5	2.4	1.0	0.6	0.3	-

Note. From Uniform crime reports by the U.S. Department of Justice, Federal Bureau of Investigation, 1980, Washington, DC: U.S. Government Printing Office.

Findings for Crime and Delinquency Savings

A simple two-group comparison of the difference in costs (based on arrests through age 20) between those who attended preschool and those who did not is presented in Table 32.[12] More appropriate estimates of the effect of the preschool program are presented in Table 33. These were generated by the estimated OLS equations presented in Table A1 in the Appendix, in which gender appears as an independent variable. The estimated effect of gender is highly significant in every equation, and the inclusion of gender decreases the estimated effect of the preschool program on crime costs. The estimated effect of the preschool program is not statistically significant in these OLS equations or in the simple two-group comparisons. However, the distribution of the dependent variable is not "well behaved." The observations on the dependent variable consist of 65 percent zeros. The remaining positive observations are skewed as well and spread over a considerable range. In the two group comparisons, the variances are found to be significantly different. Several alternative estimation procedures were employed. When the dependent variable (crime cost) is transformed to its natural log, preschool, as well as gender, is statistically significant in OLS estimation. A comparison of the results given by the linear and semilogarithmic functional forms is presented in Table A2 in the Appendix for three undiscounted cost variables. Unfortunately, the coefficients in the semilogarithmic equation do not have the same interpretation as those in the linear equation.

Table 32

COMPARISON OF COSTS OF CRIME: PRESCHOOL AND NO-PRESCHOOL GROUPS (CONSTANT 1981 DOLLARS)

Discounting Alternative	Cost of Crime Through Age 20			
	No-Preschool	Preschool	Difference	Significance[a]
Undiscounted[b]	$5,575.20	$3,677.10	$1,898.10	-
One year of preschool (discounted to age 4)				
3%	$3,649.20	$2,377.2	$1,272.0	-
5%	2,773.80	1,791.2	982.6	-
7%	2,121.80	1,357.8	764.0	-
Two years of preschool (discounted to age 3)				
3%	$3,542.90	$2,307.9	$1,235.9	-
5%	2,641.80	1,705.9	935.9	-
7%	1,983.00	1,269.0	714.0	-

[a] Two-tailed *p*-values are reported if less than .100.

[b] The same estimates of effect are used for one year of preschool and two years of preschool. Therefore the undiscounted financial benefits are the same for one and two years of preschool.

OLS estimates of the effect of the preschool program on costs, under varying assumptions regarding victim cost, are presented in Table 34. One set of estimates is derived under the assumption of zero victim cost. The other sets are derived by varying the assumption regarding the ratio of crimes committed to arrests. In these variations, victim cost for all crimes is assumed to be 5, 15, and 20 times victim cost for the arrests alone. As the ratio of 15 crimes to one arrest is about the average for all types of crime (Thornton et al., 1979), 15 times victim cost probably yields the best estimate. It should be clear from Table 34 that whatever assumption is chosen, the reduction in victim cost is small relative to that in CJS cost. The reason is that victim cost, as measured in this analysis, is quite small relative to CJS cost.

Table 33

OLS ESTIMATES OF THE PRESCHOOL PROGRAM'S EFFECT ON CRIME COSTS THROUGH AGE 20 (CONSTANT 1981 DOLLARS)

Discounting Alternative	Effect of Preschool	Significance[a]
Undiscounted	-$1,574.20	-
One year of preschool (discounted to age 4)		
3%	-$1,060.80	-
5%	-$ 822.45	-
7%	-$ 641.81	-
Two years of preschool (discounted to age 3)		
3%	-$1,029.90	-
5%	-$ 783.29	-
7%	-$ 599.84	-

[a] Two-tailed *p*-values are reported if less than .100.

The estimated lifetime effect of the preschool program on crime costs was calculated by extrapolating from the last three years for which data were available for all waves. The OLS estimate for the average reduction (in constant 1981 dollars) in undiscounted CJS cost is $197.91 and for the average reduction in undiscounted victim cost (arrests only) is $6.77. The latter figure was multiplied by 15, and the sum of this and CJS cost was used in the extrapolation procedure described previously. The results, after discounting are presented in Table 35. The total estimated lifetime effect of preschool on costs of crime is obtained by adding the figures in Table 34 to those in Table 35. The results are presented in Table 36.[13]

Two alternative procedures were used to obtain estimates of preschool's effect on the cost of crime and these may be more appropriate, given the distribution of the dependent variable. In both procedures the observations on the dependent variable are divided into those for no arrests (and hence no cost) and those for one or more arrests. The resulting dichotomous variable is used to estimate preschool's effect on the probability of one or more arrests. Probit and OLS equations were estimated, and the results are presented in Table A3 in the Appendix. Preschool has a statistically significant effect, reducing the probability of one or more arrests by almost 20 percent. OLS equations were also estimated for preschool's effect on the number of arrests and the cost of crime for those who had been arrested at least once. The results are presented in Table A4 in the Appendix. There is a statistically insignificant (and relatively small) reduction in number of arrests and cost for this subgroup. Again, the distribution of the dependent variable is skewed, but ignoring preschool's effect within the pool of observations with one or more arrest is likely to underestimate preschool's effect on crime cost. Thus, these OLS equations are used to estimate the average number of arrests and the average cost of crime for those with one or more arrest.

Table 34

OLS ESTIMATES OF PRESCHOOL PROGRAM'S EFFECT ON CRIME COST UNDER DIFFERENT ASSUMPTIONS FOR VICTIM COST (CONSTANT 1981 DOLLARS)

		Criminal Justice System Cost Plus Victim Cost for:		
Discounting Alternative	CJS Cost per Arrest	5 Crimes/ Arrest	15 Crimes/ Arrest	20 Crimes/ Arrest
Undiscounted	$1,554.70	$1,652.60	$1,848.30	$1,946.20
One year of preschool (discounted to age 4)				
3%	$1,048.50	$1,110.00	$1,233.00	$1,294.50
5%	813.34	858.88	949.95	995.48
7%	635.03	668.94	736.74	770.64
Two years of preschool (discounted to age 3)				
3%	$1,018.00	$1,077.70	$1,197.10	$1,256.80
5%	774.61	817.98	904.71	948.08
7%	593.49	625.23	688.70	720.44

Table 35

EXTRAPOLATED PRESCHOOL PROGRAM EFFECT ON CRIME COSTS BEYOND AGE 20 (CONSTANT 1981 DOLLARS)

Discounting Alternative	Total	CJS Cost Only
Undiscounted	$5,319.66	$3,556.32
One year of preschool (discounted to age 4)		
3%	$1,870.60	$1,236.50
5%	1,130.70	747.43
7%	705.50	466.36
Two years of preschool (discounted to age 3)		
3%	$1,816.10	$1,200.50
5%	1,076.90	711.84
7%	659.35	435.85

Table 36

ESTIMATED LIFETIME PRESCHOOL PROGRAM EFFECT ON CRIME COST (CONSTANT 1981 DOLLARS)

Discounting Alternative	Total	CJS Cost Only
Undiscounted	$7,168.00	$5,111.02
One year of preschool (discounted to age 4)		
3%	$3,103.60	$2,285.00
5%	2,080.65	1,560.77
7%	1,442.24	1,101.39
Two years of preschool (discounted to age 3)		
3%	$3,013.20	$2,218.50
5%	1,981.61	1,486.45
7%	1,348.05	1,029.34

One procedure produces an estimate of preschool's effects on crime cost by combining the estimated reduction in the probability of one or more arrests with the sample estimate of the cost of crime for those with one or more arrests. The other procedure combines the estimated reduction in the probability of one or more arrests with the sample estimate of number of arrests for those with one or more arrests, and the national average cost per arrest. The calculations and resulting estimates of these procedures are presented in Table 37. The two estimates are quite close together and substantially higher than the OLS estimate, almost $2,400 compared with the OLS estimate of under $1,600 (see Table 34). This suggests that the OLS estimate may be biased downward. We nevertheless continue to incorporate the OLS estimate into the analysis because it is the most conservative.

Table 37

ALTERNATIVE CALCULATIONS FOR PRESCHOOL'S EFFECT ON CRIME COST
(CONSTANT 1981 DOLLARS)

National Average Number of Arrests and Crime Cost per Person with at Least One Arrest	Undiscounted Cost per Person	Times Preschool Effect (18%)[a]
National average crime cost	$13,300	$2,391
4 arrests[b] times $3,305 cost per arrest[c]	13,220	2,376

[a] Reduction, due to preschool attendance, in number of persons arrested at least once.

[b] Mean number of arrests for persons with one or more arrests.

[c] There are 14.9 additional crimes per arrest. If the victim costs of these crimes are added in, the undiscounted cost per person increases to $16,888 and the preschool effect increases to $3,036.

Footnotes

[1] Arrest data were collected for Michigan only, because interview responses indicated that no involvement with police occurred out-of-state. The local jurisdictions from which data were collected are the Ann Arbor Police Department, Belleville Police Department, Grand Rapids Police Department, Inkster Police Department, Jackson Police Department, Kent County Juvenile Court, Lansing Police Department, Livonia Police Department, Michigan State Police, Milan Police Department, Washtenaw County Juvenile Court, Washtenaw County Sheriff's Department, Wayne County Sheriff's Department, and the Ypsilanti Police Department.

[2] Arrest histories were constructed for all 121 continuing study participants. However, in two instances data were omitted from the analysis. First, there are ten juvenile arrests for nine persons for whom the agencies releasing the information would identify only the group (four attended preschool, five, with six arrests, did not); these arrests could not be included in the individual histories. Second, two kinds of offenses were excluded. Minor offenses that resulted in the issuance of citations only (mostly minor traffic violations) were omitted; there were 21 of these, 20 committed by the group that did not attend preschool. Homicide was also excluded. It differs from other crimes in its exceptionally high cost to society and low frequency. Also, the determinants of homicide may differ substantially from those of other crimes. Two homicides were identified in the arrest data, one for each group. Only one occurred before age 20.

[3] The exact age is unknown for six arrests, five juvenile and one adult. Upper bounds on age are known for all six, and were assigned as the ages. Other things equal, this assumption tends to reduce the estimated effect of preschool because it increases the number of years over which costs are discounted.

[4] An exception to this is homicide. Thornton et al. (1979) derived the cost estimates for homicide from other studies. This exception is not relevant, since homicide is excluded from the analysis.

[5] These three hours could be either detective unit, crime prevention unit, or juvenile officer staff time. The mean cost per hour for the three types of personnel was used.

[6] This proportion could be calculated for 1973-1979 but had to be estimated for 1969-1972, based on the later years.

[7] The use of caseload as a divisor introduces a slight upward bias in costs as some cases come before the court for more than one arrest in a year. In 1979, for example, there were 716 cases accounting for 808 referrals to the court for delinquency.

[8] The information on average length of temporary detention was obtained from the Washtenaw County Juvenile Court's 1980 Annual Report (Dansereau, 1980, p.14).

[9] National expenditure data were obtained from Expenditure and Employment Data for the Criminal Justice System, 1978 (U.S. Department of Justice, 1981).

[10] This procedure has a number of shortcomings, including these: The representativeness of the Baltimore data is unknown, both for the nation and across time, and the national average cost figure derived is the average current expenditure, not the present value of an arrest's CJS costs over time. However, no better estimates were available, and it was not within this study's scope to develop new measures of the costs of crime.

[11] There were two instances each of arson and rape.

[12] It is noted again that homicide is excluded from the analysis, as are minor violations that resulted in citations only, because these types of crime were judged to be substantially different from most other crime.

[13] For several reasons the cost reductions resulting from a preschool program's effects on crime might be substantially higher than the estimates developed in this analysis. One reason is that the victim costs of crime probably have been severely undercounted. Not included were the private costs of crime prevention, for example, expenses for security hardware and services by home owners and businesses and housing costs and lifestyle changes that result from attempts to reduce the risk of victimization. These private costs are quite large. Private security forces alone cost several billion dollars nationally. Yet the unmeasured opportunity costs of protective behavior may be even higher. Clotfelter (1980) concluded that "Protective measures such as staying at home at night or not talking to strangers appear to be increasingly important responses to the threat of crime, and the opportunity costs associated with these precautions probably exceed total out-of-pocket expenditures for protection." There are other even more difficult to quantify costs that should be included in a full accounting. The mental pain, anguish, and fears suffered by people who are victims or believe that they are potential victims are costs of crime that are not counted. For juvenile delinquency, the public costs of efforts to deter delinquency and the volunteer services provided to delinquents (by lawyers, counselors, police, and others) have not been included. For adults, the foregone earnings resulting from pursuing criminal activity or from imprisonment have been counted, although these foregone earnings are to some extent offset by the part of society's prison expenses that is a transfer of value (food, shelter, and clothing) to prisoners. Finally, we include no measure of the costs of the resources devoted to criminal activity (beyond the foregone legal wages implicitly accounted for elsewhere), and these might be substantial relative to other costs (Reynolds, 1980).

CHAPTER 5

EMPLOYMENT AND EARNINGS

Data on Employment and Earnings Benefits

Basic data on employment through age 19 were obtained from the age-19 interviews. Study participants were asked for a description of their type of work, hours worked per week, pay per hour, and dates of employment for their four most recent (including current) jobs. The earliest reported employment is at age 12, although few participants report employment prior to age 16. Report of employment before age 16 is expected to be an undercount because of problems of recall and, perhaps more important, because the interview form allowed space for four jobs only. Respondents who held a different job every year had no place to list jobs held prior to age 16. Respondents who held more than one job in a year were even more restricted in the period of employment they could describe. The extent and direction of bias that might result is unclear: Those who attended preschool are expected to be employed more of the time but they may have lower turnover rates.

The number of participants reporting some employment at each age is presented in Table 38. The number reporting employment prior to age 16 is quite small, and these cases are excluded from the analysis because of the potential problems just discussed. With regard to underreporting more generally, some information is provided by a partial check of CETA records. This reveals a substantial underreport of CETA jobs: of the 16 CETA jobs identified, only 3% were reported.[1] This underreport tends to downward bias the estimated effect of the preschool program on earnings.

Table 38

SELF-REPORTED EMPLOYMENT BY AGE

	Age							
Employed (out of 121)	12	13	14	15	16	17	18	19
Number	1	1	1	3	10	27	56	85
Percent	0.8	0.8	0.8	2.4	8.3	22.3	46.2	70.2

The self-report data were in some cases supplemented to calculate earnings more accurately. The most important instance of this is for participants who were in the armed forces. For these individuals reported rates of pay did not always include allowances and never included other advantages such as free or subsidized goods and services, and the tax advantages of these goods, services, and allowances. To provide a more accurate representation of their real compensation, the Department of Defense average cash Basic Military Compensation statistics for 1981 were used to replace reported earnings.[2] Two other instances where interview data were supplemented are notable. In a few cases where interview responses were incomplete or subject to varying interpretation, a later interviewer sought clarifications from the study participants. Additionally, in several cases where wage data were not provided, the legal minimum wage was imputed; this was only done when the jobs were clearly minimum wage type of employment.

Four types of data were used in extrapolating earnings beyond age 19. Three types--survival rates, labor force participation rates, and annual earnings--are derived from national data. Survival rates give the probability of surviving to a given age, and were obtained for nonwhite men and women separately. The source for survival rates is Vital Statistics of the United States, 1978 (National Center for Health Statistics, 1980, sec. 5, p. 12). Labor force participation rates give the probability of being employed or looking for employment, and were obtained for black men and women separately, by age and level of educational attainment. The source of these data is a special annual tabulation of information collected through the Current Population Survey, conducted for the U.S. Bureau of Labor Statistics by the Bureau of the Census. The labor force participation data used in this analysis were collected in March 1979. Earnings data give the mean annual earnings in 1979, of those who had some earnings that year, for black men and women separately, by age and educational attainment. The source of the earnings data is the March 1980 Current Population Survey (U.S. Bureau of the Census, 1982). The fourth type of data used to extrapolate earnings concerns educational attainment. Educational attainment at age 19 was determined from official records and age-19 interviews. Obviously, at age 19 final educational attainment was unknown and had to be estimated.

Method of Estimating Employment and Earnings Benefits

Estimation of preschool's effect on earnings through age 19 was relatively straightforward. Individual employment and earnings histories were constructed from the age-19 interview responses. These histories include annual earnings from legitimate employment from age 16 to age 19. Fringe benefits are not included. To correct for inflation, reported earnings were adjusted to constant 1981 dollars, using the implicit price deflator for GNP. To calculate the present value of earnings through age 19 for each study participant, the constant dollar earnings were discounted and summed across years. The effect of preschool on earnings through age 19 was estimated directly from these discounted figures by ordinary least squares (OLS).

Estimation of the effect on earnings beyond age 19 was more complicated but was based on a relatively standard procedure for estimating lifetime earnings (Miller & Hornseth, 1967). The fundamental premise of this procedure is that earnings can be predicted from educational attainment (which is in turn influenced by preschool). This procedure can be divided into two basic steps. The first step is the calculation of average annual real earnings for each group (preschool, no-preschool) at each age from 20 through 70. The formula used to calculate average annual real earnings is equation 1:

Equation 1

$$\underline{Y}_{\underline{ik}} = [\Sigma_{\underline{jm}} (\underline{E}_{\underline{ijm}} \underline{P}_{\underline{ijm}} \underline{A}_{\underline{jmk}} \underline{S}_{\underline{im}})] / 2$$

where,

$\underline{Y}_{\underline{ik}}$ = average real earnings at age $\underline{i}$ for group $\underline{k}$ (preschool or no-preschool).

$\underline{E}_{\underline{ijm}}$ = mean real earnings of those reporting earnings at age $\underline{i}$, and educational attainment $\underline{j}$, for gender $\underline{m}$.

$\underline{P}_{\underline{ijm}}$ = probability of having some earnings at age $\underline{i}$, and educational attainment $\underline{j}$, for gender $\underline{m}$.

$\underline{A}_{\underline{jmk}}$ = probability of having education attainment $\underline{j}$, for gender $\underline{m}$ in group $\underline{k}$.

$\underline{S}_{\underline{im}}$ = probability of surviving to age $\underline{i}$ for gender $\underline{m}$.

These average annual earnings estimates were then used to calculate an estimate of the increase in discounted lifetime real earnings attributable to preschool, by way of equation 2:

Equation 2

$$\underline{D} = \sum_{i=20}^{70} \frac{\underline{D}_{\underline{i}} \quad (1 + \underline{g})_{\underline{i}-\underline{n}+1/2}}{(1+\underline{r})_{\underline{i}-\underline{n}+1}}$$

where,

$\underline{D}_{\underline{i}} = \underline{Y}_{\underline{i}1} - \underline{Y}_{\underline{i}2}$, the difference between average real earnings at age $\underline{i}$ for the preschool and no-preschool groups.

$\underline{g}$ = estimated annual real growth in earnings per person.

$\underline{r}$ = discount rate.

$\underline{n}$ = age at preschool entry (3 or 4).

A detailed explanation of the procedure represented by equations 1 and 2 follows. The variables appearing in these equations are discussed in order of their appearance.

The basic data on earnings are the CPS estimates of mean earnings in 1979 for all people reporting some earnings during 1979.[3] These data provide estimates for black men and women separately, by age and educational attainment. These estimates are for grouped data and are presented in Tables 39 and 40 by the three education categories used in this analysis. A category for less than nine years of education was not used because there were too few observations in this category to provide reliable estimates. Three persons, all in the no-preschool group, did not complete ninth grade but were treated as if they had; this introduces a slight downward bias to the estimate of preschool's effect on earnings. Even for the three categories used, figures for some of the later age groups had to be inferred from more general statistics. The methods of inference are indicated in footnotes to the tables.

Table 39

MEAN EARNINGS BY AGE AND EDUCATIONAL ATTAINMENT FOR BLACK MEN WITH SOME EARNINGS IN 1979

Age Group	Years of Educational Attainment		
	9-11	12	13+
18-24	$ 3,930	$ 6,314	$ 6,125
25-29	8,720	10,470	12,425
30-34	9,226	11,997	15,784
35-39	9,336	14,117	18,467
40-44	11,758	14,018	18,631
45-49	12,926	13,435	19,433[a]
50-54	10,479	11,921	19,433[a]
55-59	10,392	14,761	19,561[b]
60-64	9,599[b]	11,696[b]	17,671[b]
65+	4,209[b]	6,839[b]	10,131[b]

[a] Mean for 45-54 age group.

[b] No figure reported, due to small sample size in age bracket. Earnings were estimated from reported figures for white men, and the ratio of earnings for white men to earnings for black men, by educational attainment.

Table 40

MEAN EARNINGS BY AGE AND EDUCATIONAL ATTAINMENT FOR BLACK WOMEN WITH SOME EARNINGS IN 1979

	Years of Educational Attainment		
Age Group	9-11	12	13-15
18-24	$2,124	$4,272	$ 5,520
25-29	5,010	7,263	9,386
30-34	5,856	7,935	10,880
35-39	5,212	8,646	12,873
40-44	5,961	8,190	10,286
45-49	4,802	7,477	15,046
50-54	6,203	9,563	15,871[a]
55-59	5,505	8,033	15,494[a]
60-64	5,790[a]	8,100[a]	14,558[a]
65+	3,460[a]	4,467[a]	6,630[a]

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[a] No figure reported, due to small sample size in age bracket. Earnings were estimated from reported figures for white women, and the ratio of earnings for white women to earnings for black women, by educational attainment. Average ratio across all ages was used for education levels 9-11 and 12. For 13+ years this average was clearly unreasonable as an estimate for age 50 and beyond, so the ratio for the oldest bracket reporting data, 45-49, was used.

Mean earnings estimates (for those with some earnings) for each age were generated by two interpolation procedures. One was a simple linear interpolation between midpoints of the age groups. The other was an OLS estimation of equation 3:

Equation 3

$$\underline{Y_{ij}} = \underline{a} + \underline{b}\ \underline{(Age)} + \underline{c}\ (\underline{Age})^2 + \underline{E}$$

where,

$\underline{Y_{ij}}$ = mean earnings at age $\underline{i}$ and educational attainment $\underline{j}$.
$\underline{Age}$ = the midpoint of each age category.
$(\underline{Age})^2$ = the age variable squared.
$\underline{E}$ = a stochastic error term.

The results of the OLS procedure were judged to be more reasonable because they exhibit a less steep decline at each end of the age spectrum. However, estimations are carried out using both sets of results, and the method of interpolation has relatively little effect on the outcome, as will be seen.

The mean earnings statistics represent some of the effects of unemployment because these statistics are for all people who had some employment during the year. People who are unemployed have lower earnings as a result, other things being equal. The statistics do not account for the zero earnings of people who were not working the entire year, however. To correct for this, the mean earnings estimate for each age and educational attainment level is multiplied by a labor force participation rate. Labor force participation rates closely approximate the percent of persons having earnings in a year, although the former tend to be slightly lower than the latter.[4] Thus, use of the labor force participation rates leads to a slight downward bias to the estimate of preschool's effect on earnings.

Labor force participation rates are reported by race, gender, age group, and educational attainment group. The rates used are presented in Tables 41 and 42. The educational attainment category 13-15 years is used because figures are not reported for 13+ as a category (U.S. Bureau of Labor Statistics, 1981) and data are sparse in the 16 and 16+ categories. As rates are expected to be higher for 13+, this is another source of underestimation. A simple interpolation between age group midpoints was used to generate a set of rates for each age by educational attainment group. Interpolation by OLS estimation was not pursued for labor force participation rates because of the small number of age groups. Multiplying the interpolated mean earnings (for all those with earnings) figures by the interpolated labor force participation rates yields estimates of mean earnings by age and educational attainment group (less than 12 years, 12 years, and more than 12 years).[5]

Estimates of annual earnings by age are produced for those who attended preschool and those who did not. This is done by calculating the expected earnings for men and women within each group (preschool, no-preschool) as the weighted average of mean earnings for the three educational attainment levels, where the weights are the percent (by gender and group) at each level of attainment. The simple mean of the values for both genders is used as the group estimate.

Estimates of educational attainment are the most important factor in our predictions of differences in future earnings between the preschool and no-preschool groups. Mean annual earnings by gender and group are calculated by gender and group, where the weights ($\underline{A}_{jmk}$) are the percents of persons with each level of educational attainment at age 19. These percents are shown in Table 43. Use of these percents probably introduces some downward bias to the estimate of preschool's effect on earnings, because there is at age 19 a higher percent of high school graduates in the preschool group, and some of these can be expected to enter college in later years. Thus, the procedure used in this analysis tends to underestimate the ultimate effect of preschool on educational attainment and thereby on earnings.

Table 41

LABOR FORCE PARTICIPATION RATES BY AGE AND EDUCATIONAL ATTAINMENT FOR BLACK MEN IN 1979

Age Group	Years of Educational Attainment		
	9-11	12	13-15
20-24	81.8%	92.4%	68.5%
25-34	84.1	93.4	93.2
35-44	88.9	93.3	96.5
45-54	85.6	88.9	84.0
55-64	57.2	73.7	68.6[a]
65+	19.4	25.2[a]	25.4[a]

[a] Estimated from the rates for attainment level 9-11, and ratios of rates for 9-11 years to rates for 12 and for 13+ years for white men in these age brackets.

Before mean earnings over both genders within a group can be calculated, annual earnings estimates must be multiplied by suvival rates ($\underline{S}_{im}$). These rates give the proportion of blacks surviving from birth to a given age, by gender. The survival rates were adjusted to reflect the start of the preschool program at age 3 for most of the participants.[6] At age 19 none of the participants had died. The survival rates predict one death by age 19, but given the sample size (123), this difference is not statistically significant. After adjustment for survival rates, estimated mean annual earnings by age are summed across genders and divided by two, to provide an estimate for each group.

The difference between groups for mean annual earnings by age enters equation 2, where it is adjusted for growth and discounted. The result of equation 2 is the estimated effect of preschool on the present value of earnings after age 19, for a given growth rate and discount rate. Three growth rates and three discount rates were applied to produce a range of estimates that allows for evaluating the sensitivity of the estimate to the rates assumed.

Table 42

LABOR FORCE PARTICIPATION RATES BY AGE AND EDUCATIONAL ATTAINMENT FOR BLACK WOMEN IN 1979

Age Group	Years of Educational Attainment		
	9-11	12	13-15
20-24	41.5%	67.4%	65.2%
25-34	53.3	70.9	79.0
35-44	57.4	70.3	86.1
45-54	58.4	68.4	73.4
55-64	41.5	57.9	42.9[a]
65+	15.3	19.4	42.9[a]

[a] Average for 55+ bracket.

Table 43

EDUCATIONAL ATTAINMENT BY GROUP AND GENDER (n=121)

Years Attained	% of Preschool (n=58)		% of No-Preschool (n=63)	
	Men	Women	Men	Women
Less than 12	45.5	16.0	43.6	62.5
12	33.3	68.0	43.6	25.0
More than 12	22.2	16.0	12.8	12.5

Findings for Employment and Earnings Benefits

A significant effect of preschool on earnings is apparent by age 19. This effect is most evident for women; no statistically significant effects were found for men considered separately. However, if a semilog equation is estimated by OLS, the coefficients on both gender and preschool attendance are statistically significant. Linear and semilog equations for age-19 earnings are presented in Table A5 in the Appendix. Examination of mean earnings at each age from 16 to 19 (Table 44) suggests that the preschool group may forego some earnings due to its greater commitment to education. By age 19, women who attended preschool have clearly surpassed, in mean annual earnings, those who did not. For men this cannot be said. It is worth noting in this regard that evidence from the National Longitudinal Study of the High School Class of 1972 has shown women to recoup foregone earnings from college attendance at an earlier age than men (Kolstad, 1982).

Table 44

SIMPLE TWO-GROUP COMPARISONS OF ANNUAL
EARNINGS, AGES 16-19 (CONSTANT 1981 DOLLARS)

Earnings	No-Preschool	Preschool	Difference	Significance[a]
Full Sample				
Median, at 19	$1,069,80	$2,772,10	$1,702.30	.061
Mean, at 19	$4,357.60	$5,139.50	$ 781.90	-
Mean, at 18	$1,814.50	$1,819.80	$ 5.30	-
Mean, at 17	$ 632.49	$ 726.62	$ 94.13	-
Mean, at 16	$ 298.12	$ 89.44	-$ 208.68	-
Men				
Median, at 19	$2,432.40	$2,772.10	$ 339.70	-
Mean, at 19	$5,851.70	$6,202.00	$ 350.30	-
Mean, at 18	$2,596.00	$2,230.60	-$ 365.40	-
Mean, at 17	$ 730.37	$ 679.57	-$ 50.80	-
Mean, at 16	$ 197.67	$ 62.07	-$ 135.60	-
Women				
Median, at 19	$ 0	$3,247.50	$3,247.50	.058
Mean, at 19	$1,902.70	$4,308.80	$2,406.10	-
Mean, at 18	$ 544.65	$1,272.10	$ 727.45	-
Mean, at 17	$ 473.44	$ 786.84	$ 313.40	-
Mean, at 16	$ 461.35	$ 124.46	-$ 336.89	-

[a] Median values tested by median test, others by Mann-Whitney U test; two-tailed *p*-values are reported if less than .100.

The effect of preschool on total discounted earnings over the entire period from age 16-19 was also examined. Estimates by gender are presented in Table 45. There is a positive and statistically significant effect for women. There is a negative but statistically insignificant effect for men. For use in the benefit-cost analysis, simple means of the estimated effects for men and women were calculated. These are presented in Table 46.

Table 45

ESTIMATED PRESCHOOL EFFECT ON TOTAL EARNINGS, AGES 16-19, BY GENDER (CONSTANT 1981 DOLLARS)

	Men		Women	
Discounting Alternative	Preschool Effect	Significance[a]	Preschool Effect	Significance[a]
Undiscounted[b]	-$1,186.50	-	$3,266.10	.084
One year of preschool (discounted to age 4)				
3%	-$ 758.90	-	$2,042.90	.086
5%	-$ 567.76	-	$1,505.20	.088
7%	-$ 427.17	-	$1,115.30	.090
Two years of preschool (discounted to age 3)				
3%	-$ 736.89	-	$1,983.40	.086
5%	-$ 540.73	-	$1,433.50	.088
7%	-$ 399.23	-	$1,042.30	.090

[a] Two-tailed _p_-values are reported if less than .100.

[b] The same estimates of effect are used for one year of preschool and two years of preschool. Therefore the _undiscounted_ financial benefits are the same for one and two years of preschool.

Table 46

ESTIMATED AVERAGE PRESCHOOL EFFECT ON TOTAL EARNINGS, AGES 16-19 (CONSTANT 1981 DOLLARS)

Discounting Alternative	Preschool Effect
Undiscounted	$1,039.80
One year of preschool (discounted to age 4)	
3%	$ 642.00
5%	468.72
7%	344.07
Two years of preschool (discounted to age 3)	
3%	$ 623.26
5%	446.39
7%	321.54

Projections of earnings beyond age 19 were made using national data to estimate the effect of preschool on earnings over a lifetime. Before presenting these estimates, we compare the projections with earnings at the point where sample data end and projections begin, age 19. Mean earnings estimates were calculated for the sample as a whole at age 19 using the statistics that are the basis for projecting earnings beyond age 19. Using the quadratic interpolation procedure, we obtain an estimate of $3,248, and using the simple interpolation procedure, we obtain an estimate of $3,001. These estimates are 50% to 60% lower than the observed mean earnings of $4,845, and this difference is statistically significant at the .01 level.[7] The projected preschool effect on earnings at 19 is $333 based on the simple interpolation, and $294, based on the parabolic interpolation. These estimates are less than one fourth the observed preschool effect at age 19.[8] In other words, members of the sample were actually earning much more at age 19 than our estimation procedure would project, and the preschool effect on earnings at age 19 is much greater than that indicated when the projected earnings figures are used. Although it would be rash to draw strong conclusions based on comparisons at a single age, especially at an age where the projection procedure is relatively weak, the comparison does provide a warning that the projections may be substantially underestimating the effect of preschool on earnings.[9]

The results of projecting earnings and estimating the effect of preschool on earnings after age 19 are presented undiscounted and discounted at 3, 5, and 7 percent, for productivity growth rates of 0, 2, and 3.5 percent. The results are presented in Table 47 for the simple interpolation, and in Table 48 for the quadratic interpolation. As can be seen, the choice of interpolation procedure is inconsequential relative to the choice of discount and growth rates. The difference in estimates yielded by the most and least favorable combination of rates is almost an order of magnitude (the zero discount rate is not considered). The choice of a discount rate has been debated at great length and we do not seek to enter that debate. The range of discount rates considered here would be considered reasonable, perhaps even high, by most economists.[10] The choice of growth rate is less complicated. A 2 percent rate of growth in personal earnings seems justified, based on historical experience. In the post-World War II period, real national income per person employed has grown at about a 2 percent annual rate (Denison, 1979), and although it has grown more slowly in recent years, it seems prudent to base long-range projections on the long-run experience.

Table 47

SIMPLE INTERPOLATION PROCEDURE FOR EARNINGS: PROJECTED EFFECT OF PRESCHOOL ON EARNINGS AFTER AGE 19 (CONSTANT 1981 DOLLARS)

Discounting Alternative	Growth Rate		
	0%	2%	3.5%
Undiscounted	$36,318.00	$59,871.00	$89,576.00
One year of preschool (discounted to age 4)			
3%	$12,044.00	$18,318.00	$25,826.00
5%	$ 6,244.40	$ 9,041.80	$12,268.00
7%	$ 3,418.10	$ 4,737.90	$ 6,205.50
Two years of preschool (discounted to age 3)			
3%	$11,693.00	$17,785.00	$25,074.00
5%	$ 5,947.10	$ 8,611.30	$11,684.00
7%	$ 3,194.50	$ 4,428.00	$ 5,799.50

The most crucial assumption in the projection of earnings is that the future time path of earnings for a cohort can be estimated reliably from current cross-sectional data on earnings and employment (adjusting for economic growth). There is no method to truly test any assumption about the future, but the assumption's accuracy in the recent past can be assessed. A recent study of lifetime earnings (U.S. Bureau of the Census, 1983) compared predictions based on cross-sectional data for 1970 with trends in cohort data for the period 1970-79. It was found that the cross-sectional earnings data did reflect actual earnings trends of the following decade. The results regarding employment were less favorable, however. While there were relatively slight differences for men, the cross-sectional data failed to predict the substantial increase in employment rates for women during the 1970-79 period. The ultimate implication for this analysis is that projected future earnings of women are underestimated, and thus the preschool effect on lifetime earnings is likely to be underestimated.

Lifetime earnings estimates calculated by the U.S. Bureau of the Census (1983) provide the basis for a rough estimate of the potential bias introduced by the two assumptions just discussed. These estimates are based on the same CPS data used in our analysis but are for all races combined and use estimates of trends in future employment rates based on projections of labor force participation rates developed by the Bureau of Labor Statistics.[11] In addition, there is some slight difference in the definition of educational attainment categories. The procedure used to estimate preschool's effect on lifetime earnings, based on these alternative lifetime earnings estimates, is shown in Table 49. Assuming a 2 percent growth rate and a 5 percent discount rate, the estimated present value of preschool's effect on earnings from age 19 to age 65 is almost $30,000. This estimate is more than three times the estimate in Table 48, (i.e., $9,105), which suggests that our assumptions regarding the labor force participation rates of women may be producing a serious underestimate of preschool's effect on lifetime earnings.

Another important assumption in this analysis is that earnings reflect productivity. This assumption may be questioned for several reasons. One deserving of attention is that race and sex discrimination depress earnings of blacks and women below the value of their marginal product. If this is the case, then earnings underestimate the the value of the increased economic output produced by those who attended preschool. Unfortunately, there is no generally agreed-upon estimate of the effects of discrimination. However, an upper-bound value for the potential underestimate that results from neglecting the effects of discrimination on earnings could be obtained by using earnings and employment data for whites rather than blacks to project the preschool effect on labor force productivity.

Table 48

QUADRATIC INTERPOLATION PROCEDURE FOR EARNINGS: PROJECTED EFFECT OF PRESCHOOL ON EARNINGS AFTER AGE 19 (CONSTANT 1981 DOLLARS)

	Growth Rate		
Discounting Alternative	0%	2%	3.5%
Undiscounted	$36,442.00	$59,812.00	$89,175.00
One year of preschool (discounted to age 4)			
3%	$12,129.00	$18,412.00	$25,889.00
5%	$ 6,286.90	$ 9,105.40	$12,339.00
7%	$ 3,433.70	$ 4,770.40	$ 6,250.00
Two years of preschool (discounted to age 3)			
3%	$11,776.00	$17,876.00	$25,135.00
5%	$ 5,987.50	$ 8,671.80	$11,751.00
7%	$ 3,209.10	$ 4,458.30	$ 5,841.10

A common objection to the procedure used to estimate the effect of preschool on lifetime earnings does not apply to this analysis. The objection arises from two different perspectives. First, from the perspective of human capital theory it is argued that the observed relationship between educational attainment and earnings reflects not only the effect of education on earnings but also an effect of ability (and perhaps other important variables) on earnings, educational attainment and ability being positively correlated (Link & Ratledge, 1975). If an intervention simply increases educational attainment, then use of the observed relationship overestimates the effect on earnings. This is not the case in this instance, however, for the preschool intervention influences a constellation of variables related to educational attainment, including achievement tests, which may be considered measures of ability. Second, an objection arises from the perspective of "screening" theory (Spence, 1973). If education does not increase productivity, but merely measures it, then increasing educational attainment by "fooling" the measurement system has no positive social value. Again, however, the evidence is that preschool increases educational attainment indirectly (by increasing ability, etc.), and does not interfere with the measurement process postulated by screening theory. Productivity increases are thus expected to accompany the increased attainment.

Table 49

CALCULATION OF UPPER-BOUND ESTIMATE FOR PRESCHOOL'S EFFECT ON EARNINGS AFTER AGE 19 (CONSTANT 1981 DOLLARS)

	Preschool (n=58)					No-Preschool (n=63)				
Years of Schooling	% in Category		Lifetime Earnings for Category[a]		Total Earnings	% in Category		Lifetime Earnings for Category[a]		Total Earnings
Men										
< 12 yrs	45.5%	x	$304,000	=	$138,000	43.6%	x	$304,000	=	$133,000
12 yrs	33.3	x	438,000	=	146,000	43.6	x	438,000	=	191,000
13-15 yrs	21.2	x	570,000	=	121,000	12.8	x	570,000	=	73,000
Total					$405,000					$396,000[b]
Women										
< 12 yrs	16.0%	x	$129,000	=	$21,000	62.5%	x	$129,000	=	$ 81,000
12 yrs	68.0	x	233,000	=	158,000	25.0	x	233,000	=	58,000
13-15 yrs	16.0	x	281,000	=	224,000	12.5	x	281,000	=	35,000
Total					$224,000					$174,000

Preschool effect = ($405,000 - $396,000 + $224,000 - $174,000)/2
= $29,500 per person

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[a] Assuming 5% discount rate and 2% growth rate (U.S. Bureau of the Census, 1983.)

[b] Due to rounding, totals may differ from column sums.

To this point our analysis has been limited to estimating the effect of preschool on earnings alone. The additional value of fringe benefits and nonpecuniary benefits has not been considered because the age-19 interview does not provide necessary data. This omission is quite important. In 1981, total employee benefits (defined to include legally required payments; agreed-upon payments, such as health insurance, paid rest periods, payments for time not worked; and other items, such as bonuses) amounted to 37.3 percent of payroll for U.S. industries (Chamber of Commerce of the United States, 1982). Although some of the components of this measure are likely to have been included in the reported earnings figures used in this analysis, the remaining fringe benefits are likely to exceed 20 percent of earnings.[12] To this 20 percent, or more, should be added the value of possible nonpecuniary benefits associated with employment—safe and healthy working conditions; employment stability; freedom to vary work hours; and, more generally, status.

If it is assumed that preschool increases total compensation by the same percent that it increases earnings, the implication is that the estimated earnings effect is at least 20 percent below the effect on total compensation. There is some evidence, however, that education has a stronger effect on total compensation than on earnings alone. Duncan (1976) reports significant relationships between education and fringe benefits and between education and nonpecuniary benefits and finds that the effect of education is considerably greater (10-25 percent) when estimated for total compensation than for earnings alone. If both this potential bias from estimating education's effect on earnings rather than total compensation, and the size of total compensation relative to earnings, are taken into account, one can conclude that preschool's effect on total compensation may be 30 to 50 percent greater than that estimated for earnings alone. That nonpecuniary benefits were increased by education is not mere conjecture on our part. At age 19 the preschool group scored higher on a satisfaction-with-work scale than the no-preschool group.

The analysis of preschool's effect on production can be extended to nonmarket activities, primarily household production by women.[13] Household production is substantial. Estimates for the United States suggest that the value added produced in the household sector exceeds one third of market output (Hawrylyshyn, 1976). Unfortunately, the available data are inadequate to provide reasonable estimates of the effect of preschool on household production. There are a few studies that have examined the relationship between educational attainment and household production, but these have been limited to married women and have either excluded blacks from the sample (Gronau, 1980) or sampled from the population generally (Hill & Stafford, 1980).[14] While specific inferences based on these data could not be considered highly reliable for the low-income black population represented by the Perry sample, general inferences provide some indication of the potential effects. They are these: Number of children is positively related to time spent in household production; educational attainment is positively related to value of household production per unit of time; educational attainment is positively related to time spent in child care activities per child; and, more generally, the allocation of time among activities in household production varies with educational attainment.[15] In short, preschool is likely to have effects (of uncertain magnitude) on household production that are to some extent counterbalancing, and the direction of the net effect cannot be predicted.[16]

In summary, we estimate that preschool's long-run effects on earnings and employment are positive and substantial. Productivity is significantly enhanced, and the economic effects on earnings and employment are positive and substantial. Productivity is significantly enhanced, and the economic consequences are observable as early as age 19. Enhanced productivity is predicted to generate a stream of returns that exceeds the cost of a year of the preschool program, under a wide range of assumptions regarding economic growth and discount rates. Evaluation of the assumptions underlying our estimates of preschool's effects on lifetime earnings and comparison of predicted and observed earnings differences at age 19 indicate that we have seriously underestimated preschool's effect on earnings. However, because the magnitude of the underestimation is uncertain and because any specific corrections to our assumptions would be arbitrary to some extent, we could not derive more appropriate estimates. Thus, our estimates of preschool's effects on lifetime earnings should be considered lower-bound estimates. Finally, in considering preschool's overall benefits in the labor market, one must consider fringes and nonpecuniary benefits. These additional benefits are estimated to equal 30 percent of the increase in lifetime earnings. Therefore in estimating preschool's long-run effect on total lifetime compensation, we multiply the estimated effect on earnings by 1.3.

Footnotes

[1] Data were available only for CETA jobs in a city bordering Ypsilanti (Ann Arbor), and these probably are a minority of the CETA jobs held by study participants. The self-report data were not corrected with the CETA data because the latter might be atypical.

[2] Some armed forces employment occurred prior to 1981, and real compensation was lower in earlier years. As Basic Military Compensation is considered to be an underestimate of total compensation, the use of 1981 statistics for earlier years was judged acceptable. The underlying question is how to measure the marginal product of those in the armed services, and there appears to be no decisively better alternative to the procedure adopted.

[3] Earnings for all years were converted to constant 1981 dollars using the GNP implicit price deflator.

[4] There appears to be little difference between labor force participation rates and the percent of persons reporting earnings in a given year. Labor force participation rates are used because the percent reporting earnings is not reported by age, gender, race, and educational attainment in the detail required for the estimation procedure used in this analysis.

[5] These and other intermediate results are available on request from the High/Scope Foundation, 600 North River Street, Ypsilanti, MI 48198.

[6] Wave Zero began preschool at age 4. Survival rates should be slightly higher for them at each age to reflect this, but the difference is relatively trivial and the single set of survival rates based on age 3 was employed.

[7] Based on a one-tailed t-test.

[8] The difference between the age-19 sample estimate and the estimates derived from earnings projections is not attributable to the labor force participation rates used in the projections, as these correspond closely to the sample's estimates of labor force participation rates.

[9] Age 19 falls below the midpoint of the initial earnings category so that unlike older ages, it is extrapolated downward based on midpoints that do not encompass it. Moreover, age 19 is part of the transitional period from school to labor force and from adolescence to adulthood. Thus, considerable differences from later labor market experience might be expected.

[10] Five and 7 percent represent the opportunity cost of capital, and approximate the average pre-tax real rate of return to the assets of nonfinancial institutions (Thompson, 1980, p. 164). Three percent was included because for several reasons the real social rate of return may be lower, and the marginal rate of time preference is probably lower. It is worth pointing out that the discounting procedure employed is not the most theoretically refined (Feldstein, 1972), but it is the most practical approach for this analysis and is not likely to lead to significant error.

[11] The U.S. Bureau of the Census (1983, p. 1) used an average of earnings across the three-year period 1978-1980 to provide a larger sample size.

[12] The employer share of the social security tax alone is now 6.7 percent.

[13] Time diary studies (Hill & Stafford, 1980) indicate that men contribute relatively small amounts of time to household production. Men may be more likely to devote time to the "underground economy," where exchange of goods and services may not be reflected in earnings but which is market production. There was no way to take this into account.

[14] The sample used by Hill and Stafford (1980) includes married men as well as women.

[15] The relationship between time allocation and educational attainment may reflect differences in preferences as well as in productivity.

[16] The relative magnitudes of the effects estimated by Gronau (1980) and Hill & Stafford (1980) are not considered to be applicable to the Perry sample. Fertility, household production, and market labor supply are interrelated; large differences between black and white women's labor market experiences suggest large differences in these other areas as well.

CHAPTER 6

WELFARE

Data on Welfare Costs

The age-19 interview provides the basic information used to estimate the reduction in welfare payments attributable to the preschool program's long-term effects. Study participants reported the amount of money per week they received from the government, other than for work, and the kind of program (e.g., AFDC, food stamps, unemployment insurance, Social Security) the money came from. This made it possible to identify payments from income-tested transfer programs, that is, welfare.

Method of Estimating Welfare Savings

The effects of the preschool program on welfare were estimated by ordinary least squares (OLS). The estimated equation is as follows (numbers in parentheses are standard errors):

$$\underline{W} = \underset{(798.92)}{-256.14} - \underset{(386.83)}{820.21}\,\underline{P} + \underset{(396.83)}{1784.6}\,\underline{G} - \underset{(193.41)}{331.32}\,\underline{I} + \underline{E} \qquad \begin{array}{l} \underline{R}^2 = .19 \\ \underline{n} = 118 \end{array}$$

where,

$\underline{W}$ = the amount of welfare received per week, annualized (i.e., times 52).
$\underline{P}$ = 1 if no-preschool, 2 if preschool.
$\underline{G}$ = 1 if male, 2 if female.
$\underline{I}$ = the interaction of P and G.
$\underline{E}$ = a stochastic error term.

On an annual basis, the estimated effect of the preschool program (in 1981 dollars) is to reduce welfare payments by $820 per person. The present value of the reduction in payments is presented in Table 50 for discount rates of 3, 5, and 7 percent.

The data that we have through age 19 provide some basis for projecting expected welfare reductions into the future. This study provides information about a number of the variables that have been found to be related to the occurrence and duration of poverty and welfare assistance. A review of the recent research literature finds some general agreement, but also some inconsistency in details across studies. However, differences in methods, in sample composition, and in the questions posed, as well as methodological flaws, make it difficult to interpret inconsistencies in results.

It seems fairly clear that the percentage of the population that is poor and receives welfare assistance at some time is relatively large and that the duration of assistance in most cases is relatively short (Coe, 1981; Hill, 1981; Levy, 1977; Rainwater, 1980). Most of those who receive welfare at some time receive it only for a short period of time. However, this finding is entirely consistent with the existence of a smaller group that is dependent on welfare for an extended period and with the long-term dependency of many of the people who receive welfare at any given time. Thus, while Hill concludes that "Regardless of the definition of poverty, over the long run, poverty is a transient state, by and large," Bane and Ellwood (1983b) conclude that about 60 percent of those identified as poor in a cross section are in the midst of a poverty spell that will last eight or more years. Similarly, Coe found that of those receiving welfare at least once during a ten-year period, 25 percent received welfare six or more years; more important, there are notable variations by individual characteristics. For example, 60 percent of black children in households that received welfare at least one of the ten years received it six or more years.

Exactly which individual characteristics are associated with increased incidence and duration of welfare assistance is less clear from empirical research. Coe's (1981) preliminary investigations indicate that the presence of young children in the households of unmarried heads, especially heads who are female and black, increases both incidence and duration of welfare spells. Bane and Ellwood (1983a) found that high school dropouts, nonwhites, unwed mothers, mothers with many children, and women who had not earned income prior to receiving welfare were more likely to have welfare spells of long duration. Using a different sample and methodology and limiting his study to effects for women who left welfare for reasons other than marriage, Plotnick (1983) found no significant effect of race and

Table 50

ANNUALIZED PER-PERSON WELFARE PAYMENT REDUCTION AT AGE 19
(CONSTANT 1981 DOLLARS)

Discounting Alternative	Welfare Reduction
Undiscounted[a]	$820.00
One year of preschool (discounted to age 4)	
3%	$511.13
5%	375.74
7%	277.83
Two years of preschool (discounted to age 3)	
3%	$496.24
5%	357.85
7%	259.66

[a] The same estimates of effect were used for one year of preschool and two years of preschool. Therefore the undiscounted financial benefits are the same for one and two years of preschool.

ethnicity on the rate of entry to or exit from welfare roles. Plotnick did find that increases in age and in the expected wage decreased the rate of entry to welfare and that the rate of exit increased with age.

The implications of the literature for projecting reductions in welfare assistance attributable to preschool are as follows. First, a substantial group of people receive welfare assistance for long periods of time, and this group is a large part of any welfare assistance cohort. Thus, it is at least possible that the cross-sectional difference found at age 19 will persist in the long run. Second, the Perry study sample in general has the characteristics associated with prolonged spells of welfare assistance, and, most important, these characteristics are more pronounced in the no-preschool group. The no-preschool group has a higher high school dropout rate, more children (or pregnancies expected to come to term), and less employment and income than the preschool group. Finally, as the number of children under 16 in the home decreases and the age of the head of household increases (at least beyond some age), welfare assistance and the magnitude of the difference between the two groups should decrease.

Unfortunately, while the literature indicates that preschool will produce long-term reductions in welfare assistance, it does not provide an adequate basis for predicting these reductions for the Perry study sample. The most widely used samples, such as the Panel Study on Income Dynamics (Hill, Hill, & Morgan, 1981), suffer from the problems of censored data on number and duration of welfare spells and differ substantially from the Perry sample in educational, economic, and demographic characteristics. Rather than employing dubious estimates of year-to-year changes in welfare status to generate projections, we examined the results of simple mathematical extrapolations of the age-19 difference in welfare assistance.

Findings for Welfare Savings

Four alternative mathematical extrapolations through age 85 were used to consider the potential magnitude of preschool's effect on welfare assistance over a lifetime.[1] The four extrapolations are these: (1) The effect is equal to that at age 19 for every year through age 85. (2) The effect declines by 50 percent every five years according to a step function. (3) The effect declines by 50 percent every ten years according to a step function. (4) The effect is double the age-19 level from age 20 through age 29 and then declines by 50 percent every ten years according to a step function. The results of these four alternatives are presented in Table 51 for the usual set of discount rates. The first three alternatives are simple attempts to explore the potential magnitude of welfare reductions. The fourth alternative is an attempt to take into account demographic trends in the sample. Specifically, it attempts to take into account the effects of increasing age, the expected increase in number of children beyond age 19, and the decrease in number of children (under age 16) in later years. The fourth extrapolation is considered to be the most realistic, although as Table 51 shows, it projects the largest reduction (after discounting).

Table 51

EXTRAPOLATED WELFARE PAYMENT REDUCTIONS AGES, 20-85
(CONSTANT 1981 DOLLARS)

Discounting Alternative	Extrapolation Procedure[a]			
	1	2	3	4
One year of preschool (discounted to age 4)				
3%	$12,684.00	$4,424.00	$6,979.30	$13,463.00
5%	6,597.00	2,866.60	4,230.60	8,103.70
7%	3,701.00	1,891.50	2,648.30	5,037.40
Two years of preschool (discounted to age 3)				
3%	$12,314.00	$4,295.20	$6,776.00	$13,071.00
5%	6,283.00	2,730.20	4,029.00	7,717.80
7%	3,458.90	1,767.80	2,475.10	4,707.80

[a] Extrapolation procedures are explained in the text.

In assessing the benefits from preschool's effects on welfare assistance, one must take into account that the benefit to society as a whole is not equal to the reduction in welfare payments. This is because the payments themselves are transfers from some people in society to others. Only the administrative costs of welfare assistance are a net cost to society as a whole.[2] Historically, average administrative costs across all welfare programs have been equal to about 10 percent of the payments.[3] It is assumed that marginal costs of administration are not significantly different from average costs in the relevant range. Applying the 10 percent administrative cost estimate to the estimated age-19 reduction in welfare payment (Table 50) and to the fourth extrapolation for reductions beyond age 19 (Table 51) yields the estimated net social benefit from reductions in welfare assistance presented in Table 52. In addition, Table 52 presents the total benefit to taxpayers, which includes both the reduction in administrative costs and the reduction in payments.

We must emphasize that the estimates of benefits from reductions in welfare presented in Table 52 are highly speculative. The data on welfare assistance to the sample are very limited at age 19. Moreover, if the most severe extrapolation of reductions beyond age 19 examined in Table 51 had been used to generate the final estimates of social and taxpayer benefits, the results would have been less than half those presented in Table 52. Nevertheless, we believe that the estimates in Table 52 are the most reasonable, given the available information.

Table 52

BENEFITS FROM EXTRAPOLATED[a] LIFETIME REDUCTIONS IN WELFARE COSTS
(CONSTANT 1981 DOLLARS)

Discounting Alternative	Social Benefits[b]	Taxpayer Benefits[c]
One year of preschool (discounted to age 4)		
3%	$1,397	$15,371
5%	848	9,327
7%	532	5,847
Two years of preschool (discounted to age 3)		
3%	$1,357	$14,924
5%	808	8,883
7%	497	5,464

[a] Based on extrapolation procedure number 4, Table 51.

[b] Administrative cost only.

[c] Payment plus administrative cost.

Footnotes

[1] The extrapolated figures are of course adjusted for survival rates (discussed in Chapter 5 in regard to the estimation of lifetime earnings).

[2] As elsewhere, we have ignored the excess burden associated with taxation and the costs of other government fiscal activities. The magnitude of these costs and the relative efficiency of the private sector are difficult to estimate with any precision. In any case, because the estimated net effect of preschool is to decrease public expenditures, ignoring these costs tends to underestimate the social benefits from preschool. Therefore it has a conservative influence on the results.

[3] According to federal budget data, administrative costs for AFDC and food stamp programs are about 12% of payments. The Medicaid program's administrative costs are about 6% of payments. General Assistance (GA) programs are state-run. Costs of GA may be about the same as for AFDC (as assumed by Thornton et al., 1979), but other estimates are as high as 19%. The mix of welfare payments is expected to change over time (e.g., GA is primarily for single adults with no children), so no attempt was made to estimate administrative costs based on the programs at age 19. Ten percent was adopted as a reasonable average figure based on the costs for individual programs.

CHAPTER 7

SUMMARY AND CONCLUSIONS

The primary goal of this economic analysis is to determine from evidence on the Perry Preschool program whether society as a whole is likely to gain from the provision of high quality early education to disadvantaged children. Each of the preceding chapters provides a part of that evidence and examines it in detail. This chapter brings together those parts, reviews costs and benefits that may be missing or relatively incomplete because of difficulties in estimating their dollar value, and presents a comprehensive view of the Perry Preschool program and its economic consequences. In doing so we go beyond a consideration of the individual components of this analysis to assess the degree of confidence that can be placed in our comprehensive estimates of the likely social gain from the public provision of preschool programs. Finally, we confront the basic issues of generalizability that must be faced in making public policy decisions based on this benefit-cost analysis.

The estimated costs and benefits can be divided into those based on observed differences between the experimental and control groups, and those based on projected differences. The observed differences were estimated from data collected through age 19 (except for crime data collected through age 20) and so provide only partial estimates of preschool's long-term benefits. The projected differences were estimated by making inferences from the observed data, and these projections extend our estimates over the lifetimes of the preschool participants. Table 53 presents what we believe to be the best estimates of costs and benefits based on observed differences. Best estimates of projected costs and benefits are added in Table 54. Estimates are presented undiscounted and for 3%, 5%, and 7% discount rates. Each category of cost and benefit is discussed briefly below.

Preschool Program Costs

Most of the data required to estimate costs of the Perry Preschool program were obtained from offical records of the program and the school system in which it operated. Thus, the cost estimates are extremely accurate. In using average costs for the Perry program we have used an upper-bound estimate, however. Some years, Perry program costs were 5 to 10 percent below average. More important, there is no presumption that the Perry Preschool program operated at the minimum cost possible, because it was a pioneering effort. The optimal pupil-teacher ratio, overall class size, and teacher qualifications are important areas for future research because of their cost implications and because research (Ruopp, Travers, Glantz, & Coelen, 1979) indicates that they are important determinants of child outcomes. Other crucial issues suggested by the Perry Preschool study include whether programs should be half-day or full-day, and whether one year at age 4 will generally prove to be as satisfactory as two years beginning at age 3. This last question may be the most important cost question of all for future research.

Table 53

ESTIMATED COSTS AND BENEFITS PER CHILD FOR THE PERRY PRESCHOOL PROGRAM THROUGH AGE 19[a] (CONSTANT 1981 DOLLARS)

Discounting Alternative	Cost of Preschool	Child Care	Education K-12	Crime Through Age 20[b]
One year of preschool				
0%	4,963	299	7,082	1,574
3%	4,818	290	5,113	1,061
5%	4,726	284	4,148	822
7%	4,638	279	3,385	642
Two years of preschool				
0%	9,708	597	7,082	1,574
3%	9,289	572	4,964	1,030
5%	9,027	555	3,950	783
7%	8,778	540	3,164	600

Discounting Alternative	Earnings, Ages 16-19[c]	Welfare at Age 19	Total Benefits	Net Benefits
One year of preschool				
0%	1,040	82	10,077	5,114
3%	642	51	7,157	2,339
5%	469	38	5,761	1,035
7%	344	28	4,678	40
Two years of preschool				
0%	1,040	82	10,375	667
3%	623	50	7,239	-2,050
5%	446	36	5,770	-3,257
7%	322	26	4,652	-4,126

[a] Except for crime, which is through age 20. This is consistent with the presentation in Chapter 4.

[b] Criminal Justice System and victim costs for known arrests only.

[c] No welfare is assumed before age 19.

Table 54

ESTIMATED COSTS AND BENEFITS PER CHILD FOR THE PERRY PRESCHOOL PROGRAM OVER A LIFETIME (CONSTANT 1981 DOLLARS)

Discounting Alternative	Cost of Preschool	Total Benefits to 19	College Cost	Earnings after 19	Crime after 20[a]	Fringes after 19[b]	Welfare after 19
One year of preschool							
0%	4,963	10,077	-1,168	59,871	5,594	17,961	3,143
3%	4,818	7,157	-704	18,318	2,043	5,495	1,346
5%	4,726	5,761	-502	9,042	1,257	2,713	810
7%	4,638	4,768	-367	4,738	800	1,421	504
Two years of preschool							
0%	9,708	10,375	-1,168	59,871	5,594	17,961	3,143
3%	9,289	7,239	-684	17,785	1,983	5,336	1,307
5%	9,027	5,770	-483	8,611	1,199	2,583	772
7%	8,778	4,652	-343	4,428	748	1,328	471

	Total Benefits to 19				Net Benefits to 19			
Discounting Alternative	Plus Earnings	Plus Crime	Plus Fringes	Plus Welfare	Plus Earnings	Plus Crime	Plus Fringes	Plus Welfare
One year of preschool								
0%	68,780	74,374	92,335	95,478	63,817	81,778	87,372	90,515
3%	24,771	30,266	32,309	33,655	19,953	25,448	27,491	28,837
5%	14,301	17,014	18,271	19,081	9,575	12,288	13,545	14,355
7%	9,049	10,470	11,270	11,774	4,411	5,832	6,632	7,136
Two years of preschool								
0%	69,078	87,039	92,633	95,776	59,370	77,331	82,925	86,068
3%	24,340	29,676	31,659	32,966	15,051	20,387	22,370	23,677
5%	13,898	16,481	17,680	18,452	4,871	7,454	8,653	9,425
7%	8,737	10,065	10,813	11,284	-41	1,287	2,035	2,506

[a] Includes victim costs for estimated crime that did not result in arrest through age 20, which was not included in Table 53.

[b] Includes fringes and nonpecuniary benefits of employment. Estimated increase is 30% of earnings increase.

Child Care Benefits

The consumer benefits of the Perry Preschool program are valued using the hours of program experience provided and the average price paid for "nursery school" by parents who paid some cash price for these services. This is almost certainly a lower-bound estimate, but no specific higher alternative was defensible. This estimate does not capture the parent's consumer surplus or the value to the child of having an enjoyable, enriching, and stimulating experience.

Educational Savings

For kindergarten through high school graduation, cost estimates are based on actual program experience for each individual, as determined from official school records and self-report. Each cost difference reflects an observed difference in educational program. The difficulty of obtaining detailed cost data limited the analysis to data from the single school district accounting for the vast majority of school years. This district's costs appear to have been intermediate relative to the districts accounting for most of the remaining school experience. For college costs the estimates are based on actual attendance through age 19, on projected attendance based on national data thereafter, and on fairly disaggregated Michigan cost figures, although these were not school-specific. Thus, we have a high degree of confidence in the estimates through high school and are reasonably confident in the college cost estimates.[1]

Aside from cost reductions, later educational benefits were generally difficult to measure. As with preschool, the immediate benefits to the participants of an improved educational experience are uncounted. Yet the participants were better off because they were more successful in school, performed at a higher level, received greater recognition, and were less often placed in special education programs. Education is expected to have a host of important effects on the participants' future well-being that we have been unable to measure or estimate. These include improvements in the quality of leisure; marital success; personal and family health; and the educational, social, and economic success of their children (Haveman & Wolfe, 1983).

An important education-related variable that is measured but which we have been unable to value is number of births to participants by age 19. Women who participated in preschool as children have only half as many births. This suggests that there may be substantially reduced medical costs (babies of teenage mothers are high-risk) and other benefits to the family from the improved spacing and timing of births. Besides the obvious benefits to mother and child, there is less strain on the young family's income. Other things being equal, fewer children means a higher income per family member (higher income per capita, though not higher income for society as a whole). We stress that at this time we have information only on births to participants as teenagers and not on ultimate family size. Moreover, we make no assertions about the social or private desirability of altering the number of children per family, but only assert that postponing births until adulthood is desirable.

Finally, there may be peer effects that are not accounted for in this study. These may occur in the classroom because other students benefit from having more successful classmates (Winkler, 1975; Henderson, Mieszkowski, & Sauvageau, 1976). There may also be long-run peer benefits for the larger community because the participants are more educated. The benefits from reduced crime (examined next) are one example of these.

Crime and Delinquency Savings

The Perry Preschool evaluation provided detailed self-report and official police and court data on crime and delinquency into early adulthood. These data provide a substantial basis for the estimation of involvement in crime and the costs to society, especially since the data can be used to bridge to other studies and to national data on involvement in crime by age.

Confidence in the cost estimates for crime and delinquency is greatest for those ages that were observed and decreases as we extrapolate beyond these ages. Also, confidence is greater for criminal justice system (CJS) costs than for victim costs, as the former are better measured by national studies. Under age 18, all estimates are based on participants' police and court records, and CJS cost estimates are based on local police and court costs. Between ages 18 and 20, all estimates are based on participants' records, and CJS cost estimates, on national data and other studies. Beyond age 20, all estimates are extrapolations based on national data for arrests by age 20, a procedure that produces a reasonable "ballpark" estimate. CJS cost estimates beyond age 20 depend on national data for costs. All victim cost estimates depend on national survey data and estimates of the ratio of arrests to total crime.

Though we have made the best use of the information available, most of the human side of the cost of crime remains uncounted. There are no estimates for the pain and suffering of victims; for the fear and distrust of potential victims; or even for the costs of locks, alarms, and private security forces. As a result, the procedures used in this analysis tend to produce lower-bound estimates of the cost of crime to society.

Earnings and Employment Benefits

Earnings differences account for most of the financial implications of employment and unemployment. Estimates of earnings through age 19 are based on self-report. There is reason to suspect that these earnings may be underreported and thus may tend to produce an underestimation of preschool's effect. Estimates of earnings beyond age 19 are based on educational attainment observed at age 19 and on national cross-sectional data that relate educational attainment to earnings. Thus there is somewhat greater uncertainty regarding the post-age-19 estimates. Nevertheless, the estimation procedure is quite defensible and rests on assumptions that seem likely to generate lower-bound estimates of preschool's effect on lifetime earnings. Comparison of observed and predicted earnings at age 19 also suggests that the predicted values are underestimations. Evaluation of alternative assumptions indicates that underestimation of preschool's effect on earnings is potentially quite serious, perhaps as great as 300 percent.

Increased earnings are not the only financial returns from improved education, but we have had limited success in including others. Based on estimates from national survey data, preschool's effect on fringe benefits and on nonpecuniary benefits from employment is estimated to be 30 percent of the effect on earnings beyond age 19. No effect on fringes or nonpecuniary benefits is estimated for employment prior to age 20. One aspect of economic success that was measured but not included in this analysis is increased savings by those who attended preschool. We cannot ascertain whether this is entirely attributable to higher income or whether education also changed such characteristics affecting savings, such as attitudes toward risk, time horizons, and skill in household management and personal finance. Indeed, education is expected to have an effect on household production (e.g., cooking, cleaning, shopping, childrearing) generally that would improve the quality of life for adults and their families beyond what is indicated by the preschool group's higher earnings. Unfortunately, our age-19 interview does not provide information about these activities.

Welfare and Economic Dependency Savings

Information on welfare was more limited than that for any of the other categories of estimation. Members of the Perry sample receive welfare assistance in their own right only as they become adults, so the observable history is relatively short. Also, our access to official records was somewhat more restricted, and we have less confidence in the completeness of these records than in that of crime records. The estimates for age 19 are relatively reliable because they are based on self-report at that time. However, it has proved difficult to develop accurate extrapolations beyond age 19.

A review of the literature leads us to expect substantial long-term decreases in welfare assistance as a result of preschool, given the Perry sample's characteristics, the observed reduction in welfare assistance, and other effects observable at age 19 (financial independence, earnings, education, and number of children). Unfortunately, the existing literature provides no specific guidance in the extrapolation of lifetime welfare assistance patterns for the sample. To explore the potential magnitude beyond age 19, a range of plausible extrapolations was considered. Although the specific numbers generated by these extrapolations are not very defensible, they provide some notion of the magnitude of effect that might be expected, in view of the effect at age 19. In this chapter's summation of costs and benefits, we have used the extrapolation that we believe to be the most theoretically defensible, although it is also the largest. Given the uncertainty of our estimates regarding welfare, it is fortunate that the importance of welfare to the analysis is relatively slight. Only the administrative cost (about 10 percent of payments) is an expense to society as a whole; the payments are transfers from one group of people to another. The effect on welfare assistance is considerably more important when we consider the distributional consequences of the preschool program, however.[2]

Beyond the direct costs of welfare, we have been unable to measure the value of economic independence. It has some value simply because it is important in our society to be self-reliant. It may also have some value because welfare may have some negative effects on recipients. Procedures for obtaining welfare can be denigrating and are necessarily intrusive, and criteria for recipients may alter people's choices about family formation and employment in ways that are not desirable for either the individual or society.

Summary Assessment of Individual Estimates

Bringing together the individual estimates of costs and benefits just reviewed produces a very conservative assessment of the profitability of the Perry Preschool program for society as a whole. The cost of the program seems likely to be overestimated, while the benefits in child care, education, earnings, and crime reduction seem likely to be underestimated. It is difficult to judge whether welfare reductions are underestimated or overestimated, but any error is unlikely to affect the overall results significantly. These judgments about our estimates should be kept in mind when considering the summation of costs and benefits presented in the next sections.

Summation of Costs and Benefits Through Age 19

From Table 53 it is clear that even based upon the incomplete data available at age 19, one year of preschool is likely to be a good social investment, if we assume that one and two years of preschool have the same effect.[3] The net present value of costs and benefits is positive at discount rates of 3, 5, and 7 percent. Given that preschool's estimated cost is an upper bound and that the benefits are not expected to end at age 19, it seems likely that even at rates above 7 percent, preschool may be a good investment. Preschool's effect on education is by far the most important factor in determining preschool's profitability through age 19. Education cost savings account for the vast majority of all benefits and at a discount rate of 3 percent are more than sufficient to make preschool a profitable investment. without considering any other benefits.

To obtain statistical evidence of the confidence we can place in our conclusions, we summed all benefits through age 19 for each person in the sample and estimated preschool's effect on that total. The estimated mean effects and their standard errors are presented in Table 57 for benefits to society as a whole and for benefits to taxpayers and potential crime victims.[4] The latter category is of interest because it measures the benefits to those paying for the program. Some of these taxpayer benefits are transfer payments from the perspective of society as a whole, so it does not represent the net effect on everybody. However, it does represent the taxpayers' interest in the program. The findings presented in Table 56 indicate that, statistically, the estimated benefits are significantly different from zero (at the 10 percent level of confidence). We have less confidence, however, that the differences between benefits and costs is statistically significant. Specifically, the cost of the preschool program falls within a one-standard-error confidence interval around the total of estimated benefits. Nevertheless, Table 53 presents the best possible estimates of the benefits through age 19 to taxpayers and to society as a whole, and these exceed the costs of one year of the preschool program at discount rates up to and including 7 percent. In the next section we consider the estimated benefits beyond age 19, and the extent to which they increase our confidence that the preschool program is a profitable investment for taxpayers and society as a whole.

Summation of Costs and Benefits Over a Lifetime

Estimates for costs and benefits beyond age 19, as well as preschool's costs and total benefits through age 19, are presented in Table 54.[5] In addition there are four total- and four net-benefit columns. These columns add, one at a time, each of the major post-19 benefit estimates to estimated benefits through age 19. This illustrates the effect of each benefit—earnings, crime cost reductions, fringes and nonpecuniary benefits of employment, and welfare cost reductions—on total benefits and on the net present value to society (net benefits). There are legitimate grounds for disagreement about the potential magnitudes of these benefits and the certainty with which they can be estimated, and we have discussed some of the more important issues. The presentation in Table 54 allows one to consider the effects on the end result of a range of different assumptions about each benefit.

The estimates presented in Table 54 strengthen the conclusion that one year of preschool is a good investment. The first net-benefit column, A, shows that when only expected earnings are added, one year of preschool is likely to yield a large positive net present value at any reasonable discount rate. Adding the other projected benefits increases the net present value by roughly 50 percent. We do not have estimated standard errors to provide confidence intervals for estimated benefits beyond age 19 that are not based on direct observation. However, an interesting test of the robustness of our estimates is provided by postulating a 50 percent reduction in all estimated benefits. The result is unequivocal. Even if all benefits are only half what we have estimated, one year of preschool is a good investment. Moreover, this conclusion holds even if all benefits beyond age 19, except earnings, are excluded.

Two years of preschool are also found to be profitable, although this cannot be said with the same certainty as for one year.[6] The addition of post-19 earnings alone is sufficent to produce a positive net present value at discount rates up to but not including 7 percent. However, with the addition of any other benefits beyond age 19, net present value is positive at 7 percent as well. If we consider the same test of robustness that was applied to one year, a 50 percent reduction in all benefits, two years of preschool pass the test at discount rates of 3 and 5 percent, but not at 7 percent. In view of the tendency for cost to be overestimated and for benefits to be underestimated, these findings for two years are remarkably strong.

In Table 54, as in Table 53, the importance to the analysis of preschool's estimated effect on education is evidenced. Prior to age 19, educational placement is the most important variable because it is the basis for estimated school cost reductions. Beyond age 19, educational attainment is the most important variable because it is the basis for estimated earnings gains and for estimated gains in fringes and the nonpecuniary benefits of employment. These predicted gains are overwhelmingly larger than the predicted benefits from crime and welfare reductions. They are also solidly based on both theoretical and empirical research on the relation of earnings to education.

The choice of discount rate is an important variable in any benefit-cost analysis. In this analysis, we have examined all our estimates and the assumptions underlying them in the context of real interest rates (that is, above inflation) ranging from 3 to 7 percent. This range is reasonable, given the historical experience of the United States. We are currently in a period of unusually high real rates of interest. This has caused some concern that our range may be too low. We do not share this concern. Nevertheless, we have also estimated costs and benefits using a set of discount rates ranging from 8 to 11 percent. The results are presented in Table 55. At the cost of one year, preschool is a good investment at rates exceeding 11 percent. At the cost of two years, it is a good investment at rates as high as 8 percent. These rates indicate the upper limits at which preschool remains profitable, or net present value is at least zero. The discount rates that yield net present value equal to zero are called **internal rates of return** and are sometimes used by economists to rank programs. In this case, the real (i.e., above inflation) internal rate of return is greater than 11 percent for one year of preschool and about 8 percent for two years of preschool.

Distribution of Costs and Benefits

The distribution of costs and benefits (undiscounted and for each of the discount rates) is described in Table 56. Estimated costs and benefits to participants (including benefits to their families) are presented in the first two columns. Those for taxpayers and potential crime victims are presented in the second two columns. The results for society as a whole are presented in the last two columns. The distribution of benefits is important for several reasons. One is that it has implications concerning the fairness of preschool as a social program. Another is that it has implications concerning by whom and under what circumstances preschool should be financed.

From Table 56 it can be seen that, through age 19, participants receive a small net benefit, at all discount rates presented. The relatively small value of benefits is in part due to the inability to adequately value nonpecuniary benefits. Over a lifetime, estimated net benefits to the participants are somewhat greater, except at a 7 percent discount rate. Again, the difficulties in valuing many of the benefits to participants must be considered. It should be recognized, however, that the low return beyond age 19 depends considerably upon the post-age-19 welfare reductions, which are among our least precise estimates.

Table 55

COSTS AND BENEFITS OF THE PERRY PRESCHOOL PROGRAM
DISCOUNTED AT 8% TO 11% (CONSTANT 1981 DOLLARS)

	One Year of Preschool Discount Rate:				Two Years of Preschool Discount Rate:			
Benefit or Cost	8%	9%	10%	11%	8%	9%	10%	11%
Through age 19								
Child care	277	274	272	269	533	525	519	511
Ed K-12	3,065	2,779	2,524	2,295	2,838	2,549	2,294	2,067
Crime to age 20[a]	561	496	439	389	519	455	399	350
Earnings	295	254	218	188	273	233	199	170
Welfare	24	21	18	15	22	19	16	14
Past age 19								
College	-321	-276	-238	-205	-298	-253	-216	-185
Crime	608	492	401	328	563	452	364	295
Earnings	3,521	2,629	1,985	1,514	3,260	2,412	1,805	1,364
Fringes[b]	1,056	789	596	454	978	724	542	409
Welfare	418	336	272	221	387	308	247	199
Total	9,576	7,857	6,543	5,517	9,144	7,482	6,220	5,238
Preschool Program	-4,595	-4,553	-4,512	-4,471	-8,658	-8,541	-8,427	-8,316
Net	4,981	3,304	2,031	1,046	486	-1,059	-2,207	-3,078

[a] Criminal justice system cost + 1 victim cost; includes estimated victim costs for crime between ages 10 and 20 that did not result in arrest.

[b] 30% of earnings.

The Perry preschool participants were not charged for the program, and it is worth considering what would happen to net present value if the participants' families had paid the program's cost. At discount rates above 3 percent, the result is a net loss to the family for even one year of preschool. If we reduce the estimated benefits by half, as a test of robustness, adding the cost of a year of preschool yields a loss at 3 percent as well.

The net present value of preschool to taxpayers and potential crime victims is positive at all discount rates and for both one and two years. This is true even though taxpayers bear the entire program cost of preschool. If the analysis is restricted to estimates through age 19, net present value is positive for one year of preschool at discount rates almost as high as 7 percent. (At 7 seven percent, net present value is slightly negative.) As a test of robustness, a 50 percent reduction in all benefit estimates is considered. In this case, one year of preschool remains a good investment for taxpayers at all discount rates; two years, at 3 percent.

As with participants, the welfare estimates play an important role in the analysis of benefits to taxpayers. In this case, post-age-19 welfare represents more than half of total benefits. Nevertheless, even if the estimated post-age-19 welfare cost reduction were zero, one year of preschool would still yield a positive net present value at all discount rates. If the reduction were 50 percent of the estimated value, two years of preschool would still yield a positive net present value at discount rates of 3 and 5 percent.

Table 56 shows that taxpayers and potential crime victims receive the vast majority of all benefits at any discount rate. The most important estimate contributing to this result is the welfare estimate, and the imprecision of this estimate is therefore important. Some confidence can be gained by examining the effects of large reductions in the estimate. Even a 50 percent reduction in the welfare estimate leaves taxpayers and potential crime victims with a great majority of the benefits at all discount rates, and the higher the discount rate, the greater the proportion they receive.

Table 56

DISTRIBUTION OF COSTS AND BENEFITS
(CONSTANT 1981 DOLLARS)
USING FOUR DISCOUNTING ALTERNATIVES

A. Undiscounted

	To Participants		To Taxpayers and Potential Crime Victims		To Society	
Benefits	1-yr Program	2-yr Program	1-yr Program	2-yr Program	1-yr Program	2-yr Program
Measured (to age 19)	259	557	5,129	384	5,388	941
Preschool program	0	0	-4,963	-9,708	-4,963	-9,708
Child care	299	597	0	0	299	597
Educational cost saving	0	0	7,082	7,082	7,082	7,082
Earnings increase	780	780	260	260	1,040	1,040
Welfare reduction	-820	-820	902	902	82	82
Crime reduction	0	0	1,848	1,848	1,848	1,848
Predicted (age 19+)	31,432	31,432	53,695	53,695	85,127	85,127
College costs	0	0	-1,168	-1,168	-1,168	-1,168
Earnings increase	62,864	62,864	14,968	14,968	77,832	77,832
Welfare reduction	-31,432	-31,432	34,575	34,575	3,143	3,143
Crime reduction	0	0	5,320	5,330	5,320	5,320
Total net benefits	31,691	31,989	58,824	54,079	90,515	86,068

(continued)

Table 56 (continued)

B. Discounted at 3 percent

	To Participants		To Taxpayers and Potential Crime Victims		To Society	
Benefits	1-yr Program	2-yr Program	1-yr Program	2-yr Program	1-yr Program	2-yr Program
Measured (to age 19)	261	543	225	-2,426	2,511	-1,883
Preschool program	0	0	-4,818	-9,289	-4,818	-9,289
Child care	290	572	0	0	290	572
Educational cost saving	0	0	5,113	4,964	5,113	4,964
Earnings increase	482	467	161	156	642	623
Welfare reduction	-511	-496	562	546	51	50
Crime reduction	0	0	1,233	1,197	1,233	1,197
Predicted (Age 19+)	4,856	4,715	21,562	20,933	26,326	25,560
College costs	0	0	-704	-684	-704	-684
Earnings increase	19,233	18,674	4,580	4,446	23,813	23,121
Welfare reduction	-13,463	-13,071	14,809	14,378	1,346	1,307
Crime reduction	0	0	1,871	1,816	1,871	1,816
Total net benefits	5,117	5,258	23,813	18,507	28,837	23,677

(continued)

Table 56 (continued)

C. Discounted at 5 percent

Benefits	To Participants		To Taxpayers and Potential Crime Victims		To Society	
	1-yr Program	2-yr Program	1-yr Program	2-yr Program	1-yr Program	2-yr Program
Measured (to age 19)	260	532	903	-3,778	1,163	-3,135
Preschool program	0	0	-4,726	-9,027	-4,726	-9,027
Child care	284	555	0	0	284	555
Educational cost saving	0	0	4,148	3,950	4,148	3,950
Earnings increase	352	335	117	111	469	446
Welfare reduction	-376	-358	414	394	38	36
Crime reduction	0	0	950	905	950	905
Predicted (Age 19+)	1,391	1,323	11,803	11,237	13,194	12,560
College costs	0	0	-502	-483	-502	-483
Earnings increase	9,495	9,041	2,260	2,153	11,755	11,194
Welfare reduction	-8,104	-7,718	8,914	8,490	810	772
Crime reduction	0	0	1,131	1,077	11,317	1,077
Total net benefits	1,651	1,855	12,706	7,459	14,357	9,425

(continued)

Table 56 (continued)

D. Discounted at 7 percent

Benefits	To Participants		To Taxpayers and Potential Crime Victims		To Society	
	1-yr Program	2-yr Program	1-yr Program	2-yr Program	1-yr Program	2-yr Program
Measured (to age 19)	259	522	-124	-4,559	135	-4,037
Preschool program	0	0	-4,638	-8,778	-4,638	-8,778
Child care	279	540	0	0	279	540
Educational cost saving	0	0	3,385	3,164	3,385	3,164
Earnings increase	258	242	86	80	344	322
Welfare reduction	-278	-260	306	286	28	26
Crime reduction	0	0	737	689	737	689
Predicted (Age 19+)	-62	-59	7,064	6,602	7,002	6,543
College costs	0	0	-367	-343	-367	-343
Earnings increase	4,975	4,649	1,184	1,107	6,159	5,756
Welfare reduction	-5,037	-4,708	5,541	5,179	504	471
Crime reduction	0	0	706	659	706	659
Total net benefits	197	463	6,940	2,043	7,137	2,506

Table 57

OLS ESTIMATES OF PRESCHOOL'S EFFECT THROUGH AGE 19 ON BENEFITS TO SOCIETY AS A WHOLE AND TO TAXPAYERS AND POTENTIAL CRIME VICTIMS (WITH STANDARD ERRORS)

Discounting Alternative	Social Benefits	Standard Error	Taxpayer Benefits	Standard Error
Undiscounted	$9,618	(5,843)	$9,284	(5,541)
One year of preschool (discounted to age 4)				
3%	$6,846	(4,045)	$6,544	(3,874)
5%	5,525	(3,200)	5,236	(3,082)
7%	4,498	(2,553)	4,219	(2,471)
Two years of preschool (discounted to age 3)				
3%	$6,937	(3,927)	$6,353	(3,761)
5%	5,546	(3,048)	4,987	(2,936)
7%	4,483	(2,392)	3,943	(2,310)

Policy Implications

The conclusion that one year of the Perry program was a good investment for society is nearly unassailable. The conclusion that two years was a good investment is also quite strong. Clearly the cost difference between one and two years is important, and discounting also works in favor of the one-year program. The Perry preschool sample is not sufficiently large to provide clear answers about the effects of one versus two years, however. Our estimates are based on the average effects for both one and two years. If one year were to yield essentially the same benefits as two years, there would be no reason to provide two. Given the importance of program duration for costs, this is a critical issue for future research on preschool education. There is a more basic policy question that must be answered first, however. From the narrow conclusion that the Perry program was a good investment, can we generalize that programs like the Perry program will be profitable for society when provided to children like the Perry participants?[6]

For our conclusion to have policy relevance we will have to establish exactly what it means for programs to be "like the Perry program" and for children to be "like the Perry participants." The characteristics that are necessary and sufficient for a preschool program to produce long-term results have yet to be precisely defined. One effort towards this is presented in Changed Lives (Berrueta-Clement et al., 1984). Another is the meta-analysis reported in Casto and White (1984). Also, the National Association for the Education of Young Children (1983) has been developing standards for early childhood centers and schools. These standards represent "expert opinion" regarding the characteristics that effective early childhood programs should have. Finally, some research suggests that Head Start has been providing long-term educational benefits on a national scale and that Head Start has improved with experience in its ability to do so (Hubbell, 1983). In our opinion the totality of preschool intervention research indicates that we should be wary, perhaps even skeptical, of expecting the same outcomes from public preschool programs as they are presently funded and operated. The Perry Preschool program was exceptionally well funded and well run under special circumstances. Few programs are as well funded, and too often programs are not well run. Nevertheless there is some room for optimism because our own evidence suggests the possibility of substantial cost reductions (below the average Perry preschool costs) without significant loss of effectiveness.[7]

An equally difficult question is posed by what it means for a population to be "like the Perry participants." These participants were black, scored low on an IQ test as preschoolers, and had parents with little education and low incomes. Evidence from other studies suggests that the results may generalize to other low-income children and does not exclude the possibility that preschool is greatly beneficial to all children. It cannot be ruled out, however, that the use of an IQ test as a screening device may focus preschool on the children who will benefit most from preschool programs. The Perry participants had lower initial IQ's and higher gains in IQ than participants in other preschool programs for which evidence is available.[8]

In sum, the generalizability of the Perry Preschool program's results is especially problematic. Casto and White (1984, p. 11) conclude from their meta-analysis of early intervention research that the Perry study "stands out in stark contrast to the trend...for effects to 'wash out' over time." They conclude that "the preponderance of currently available evidence shows very small long-term benefits attributable to early intervention for disadvantaged children." However, Casto and White also emphasize, and we concur, that there are a relatively small number of adequately designed studies for drawing conclusions about preschool intervention's long-term effectiveness, however. Thus, we cannot determine whether the lack of corroboration is due to poor program performance or to poor program evaluation. Until additional adequately designed studies are conducted, it will remain difficult to assess the generalizability of our findings.

If one concludes from the Perry study that preschool is a good investment for some children and acknowledges that it may be a good investment for all children, there is still not sufficient reason to urge public funding of preschool on economic grounds alone. Public funding requires that some public purpose must be demonstrated. The estimated distribution of the Perry program's costs and benefits makes clear this public purpose and its limitations. Taxpayers have much to gain from preschool and find preschool a good investment even if they pay the full cost of the program. Participants gain if preschool is provided at no cost to them, but have very limited incentives to pay a significant portion of costs, particularly if they are from low-income families facing more immediate needs.[9] If taxpayers wish to obtain the benefits of preschool, it seems likely that they will have to pay for them by financing preschool publicly.

The conclusion that preschool should be publicly funded is strongest for children from low-income families and perhaps for handicapped children.[10] Our research provides a less adequate basis for recommending public funding for universal preschool programs. Even if preschool has the same cognitive and other benefits for nonhandicapped children from higher-income families, these children are unlikely to impose the kinds of high costs on taxpayers that were reduced by the Perry program. To the extent that preschool generates substantial long-term benefits for middle-class children, these benefits are more likely to accrue to the participants themselves. At the same time, their families have a greater ability to pay for preschool programs. Arguments for the public funding of preschool programs for all children must be made on grounds other than those discussed in this paper. The field should move on to discuss these arguments. The case for public funding of programs for disadvantaged children has been relatively well developed.

There is an urgent need for additional longitudinal research that is adequately designed and implemented to answer the important public policy questions about preschool intervention. The Perry Preschool study stands out for the quality of its design, its lack of attrition, the detail of its data, and its duration (age 3 through 19). Continuation of the Perry study would provide information about the adult outcomes of preschool at a cost extremely low in terms of time and effort, compared to the costs of starting up a new study. This would enable us to reduce the uncertainty that surrounds all our estimates of adult outcomes, including the economic return to society. We discussed earlier the need for additional studies as a basis for generalization. The Perry study should not continue to stand alone. It leaves too many unanswered questions about the type, duration, and intensity of intervention, and the information the Perry study does yield is derived from a small sample of children.

The need for additional research does not excuse us from making difficult decisions about public funding for preschool programs, however. We as a society must weigh the likely costs of postponing action, given the information we have, against the potential benefits of witholding action until additional research has been conducted. In our opinion, we have shown that the social costs of postponing action are potentially quite high for some children. This suggests that we should cautiously proceed to provide publicly funded preschool programs that are comparable in quality to the Perry program for modest numbers of children in low-income families. These efforts should be carefully monitored to determine if the intended long-term effects can reasonably be expected, based on effects through school age. If sufficient program effectiveness is found, program coverage should be expanded. If programs are substantially less effective than the Perry study indicates, then we should either improve or discontinue them. This suggested course will safeguard the public interest. It will also ensure that ten years from now the Perry study will not stand alone but will have been confirmed or rejected and that public policy will have been decided on a firmer basis than the research that now exists.

Footnotes

[1] The estimates have some shortcomings. For example, special education cost does not include the extra teacher time in regular class required by special education students who are not in a special class full time.

[2] Throughout this analysis we have ignored the issue of the excess burden attributable to taxes that support government expenditures, including transfer payments. Its magnitude and importance relative to inefficiencies in the private sector is a matter of considerable debate in which we do not wish to become embroiled. Instead, we simply note that because the Perry program produced a net decrease in government spending, the omission of excess burden tends to underestimate the benefits from preschool.

[3] The Perry sample is relatively small and does not allow us to estimate very precisely the effects of either one- or two-year programs separately. In the absence of strong evidence to the contrary, we estimated benefits based on average effects for both one and two years. The differences when one and two years of preschool are compared are attributable to the cost difference and, to a much lesser extent, to discounting. An exception is the amount of the child care benefit, which varies directly with program duration.

[4] Complete data on all benefit measures were available only for 109 cases. To examine the probable effect of this reduction in sample size on our estimates, estimates were made replacing missing data with the means, first for welfare assistance (which is relatively unimportant because it is only one year), and then for welfare assistance and education. The first yielded 112 cases and produced slightly higher mean effects with slightly lower standard errors. The second yielded slightly higher mean effects, with standard errors about 10 percent lower than with 109 cases.

[5] Estimates for the victim costs of projected crimes through age 19 that did not result in arrest are included in the "Crime after 20" column of Table 54, rather than in Table 53, so that Table 53 can refer to observed effects only. In Table 55, however, all estimated crime costs are allocated according to age.

[6] That one year is more profitable than two is hardly surprising, since the costs of the latter are approximately double, while the effects are approximately the same.

[7] There is an additional generalizability issue that we do not address. This is the extent to which changes in the structure of school and society may have altered the system in which preschool programs operate. For example, the ways in which children are placed in special education has changed substantially over time. An adequate examination of the issue of social change is beyond the scope of this analysis and must be addressed elsewhere. It is our opinion, however, that change has not been so substantial as to significantly alter the effects of preschool programs.

[8] See Berrueta-Clement et al. (1984) and Schweinhart and Weikart (1980) for reviews of the results of similar studies. For a brief discussion of the use of IQ's in preschool program research, see Zigler and Trickett (1978).

[9] There may be a division of interest between the needs of children and the needs of other members of the family. Low-income families are faced with especially difficult choices. In some cases children's needs may not receive the emphasis that is socially desirable; this problem may be more acute in poverty because there are fewer resources to divide.

[10] Just as children with low IQ's might gain more from preschool because they begin with greater need, handicapped children might obtain greater benefits from preschool than the average child. Also, handicapped children tend to receive publicly funded services, such as special education, vocational rehabilitation, and income maintenance programs. Taxpayers will save money if the need for these is reduced.

APPENDIX: SELECTED ESTIMATED EQUATIONS

The appendix presents selected equations that present the effects not only of the preschool variable but also of the other variables employed in the estimation of effects. Variable names are explained after each equation.

Table A1

ESTIMATED OLS EQUATIONS FOR CRIME COSTS BASED ON ARRESTS THROUGH AGE 20

$$\underline{C} = \underset{(5165.4)}{16081.} - \underset{(2500.8)}{1574.2}\,\underline{P} - \underset{(2545.1)}{6467.5}\,\underline{G} + \underline{E} \qquad \underline{R}^2 = .06$$

$$\underline{C}_{13} = \underset{(3406.1)}{10535.} - \underset{(1649.0)}{1060.8}\,\underline{P} - \underset{(1678.2)}{4218.0}\,\underline{G} + \underline{E} \qquad \underline{R}^2 = .06$$

$$\underline{C}_{15} = \underset{(2600.9)}{8012.1} - \underset{(1259.3)}{822.45}\,\underline{P} - \underset{(1281.5)}{3197.7}\,\underline{G} + \underline{E} \qquad \underline{R}^2 = .06$$

$$\underline{C}_{17} = \underset{(1998.3)}{6131.9} - \underset{(967.47)}{641.81}\,\underline{P} - \underset{(984.60)}{2439.1}\,\underline{G} + \underline{E} \qquad \underline{R}^2 = .06$$

$$\underline{C}_{23} = \underset{(3306.8)}{10228.} - \underset{(1601.0)}{1029.9}\,\underline{P} - \underset{(1629.3)}{4095.1}\,\underline{G} + \underline{E} \qquad \underline{R}^2 = .06$$

$$\underline{C}_{25} = \underset{(2477.1)}{7630.6} - \underset{(1199.3)}{783.29}\,\underline{P} - \underset{(1220.5)}{3045.4}\,\underline{G} + \underline{E} \qquad \underline{R}^2 = .06$$

$$\underline{C}_{27} = \underset{(1867.6)}{5730.8} - \underset{(904.18)}{599.84}\,\underline{P} - \underset{(920.18)}{2279.6}\,\underline{G} + \underline{E} \qquad \underline{R}^2 = .06$$

Note. Where:

$\underline{C}$ = undiscounted crime cost.
$\underline{C}_{ij}$ = crime cost discounted at $\underline{j}$ percent assuming $\underline{i}$ years of preschool.
$\underline{P}$ = 1 for those who did not and 2 for those who did attend preschool.
$\underline{G}$ = 1 for males, 2 for females.
$\underline{E}$ = a stochastic error term.

Numbers in parentheses are standard errors.

Table A2

ESTIMATED OLS EQUATIONS FOR UNDISCOUNTED CRIME COSTS BASED ON ARRESTS THROUGH AGE 20: COST AND NATURAL LOGARITHM OF COST

$$\begin{array}{lllll} \underline{TC} = & 16081 & -\ 1574.2\,\underline{P} & -\ 6467.5\,\underline{G} + \underline{E} & \underline{R}^2 = .06 \\ & (5165.4) & (2500.8) & (2545.1) & \end{array}$$

$$\begin{array}{lllll} \underline{CC} = & 15575 & -\ 1554.7\,\underline{P} & -\ 6246.6\,\underline{G} + \underline{E} & \underline{R}^2 = .06 \\ & (5021.1) & (2431.0) & (2474.0) & \end{array}$$

$$\begin{array}{lllll} \underline{VC} = & 506.24 & -\ 19.576\,\underline{P} & -\ 220.93\,\underline{G} + \underline{E} & \underline{R}^2 = .05 \\ & (176.71) & (85.557) & (87.071) & \end{array}$$

$$\begin{array}{lllll} \ln(\underline{TC}) = & 7.3702 & -\ 1.4252\,\underline{P} & -\ 1.7091\,\underline{G} + \underline{E} & \underline{R}^2 = .08 \\ & (1,4822) & (.71759) & (.73029) & \end{array}$$

$$\begin{array}{lllll} \ln(\underline{CC}) = & 7.2085 & -\ 1.3824\,\underline{P} & -\ 1.7263\,\underline{G} + \underline{E} & \underline{R}^2 = .08 \\ & (1.4629) & (.70827) & (.72081) & \end{array}$$

$$\begin{array}{lllll} \ln(\underline{VC}) = & 4.0673 & -\ .75823\,\underline{P} & -\ .98357\,\underline{G} + \underline{E} & \underline{R}^2 = .06 \\ & (.98317) & (.47600) & (.48443) & \end{array}$$

Note. Where:

$\underline{CC}$ = $\underline{CC}$ + $\underline{VC}$.
$\underline{CC}$ = criminal justice system cost.
$\underline{VC}$ = victim cost.
$\underline{P}$ = 1 for those who did not and 2 for those who did attend preschool.
$\underline{G}$ = 1 for males, 2 for females.
$\underline{E}$ = a stochastic error term.

ln is the natural log transformation, and numbers in parentheses are standard errors.

Table A3

ESTIMATED EQUATIONS FOR PRESCHOOL'S EFFECT ON THE PROBABILITY OF ONE OR MORE ARRESTS THROUGH AGE 20

Probit:

$$\begin{array}{lllll} \underline{Xb} = & -\ 0.52510\ \underline{P} & -\ 0.44936\ \underline{G} & & \underline{n} = 121 \\ & (0.24291) & (0.25003) & & \end{array}$$

OLS:

$$\begin{array}{llllll} \underline{C} = & 1.8135 & -\ 0.17975\ \underline{P} & -\ 0.14856\ \underline{G} & & R^2 = .06 \\ & (0.17464) & (0.084550) & (0.086046) & & \underline{n} = 121 \end{array}$$

Note. Where:

$\underline{Xb}$ = the sum of the products of the independent variables and their estimated coefficients.
$\underline{P}$ = 1 if no-preschool, 2 if preschool.
$\underline{G}$ = 1 if male, 2 if female.
$\underline{C}$ = 1 if 0 arrests, 2 if 1 or more arrests.

Numbers in parentheses are standard errors.

Note that the coefficients shown for the Probit equation do not have the straightforward interpretation of the OLS coefficients, since in Probit analysis the dependent variable is predicted as a nonlinear transformation of a linear function of the independent variables.

Table A4

OLS ESTIMATES OF PRESCHOOL'S EFFECTS THROUGH AGE 20 ON NUMBER OF ARRESTS AND CRIME COST FOR PERSONS WITH ONE OR MORE ARRESTS

$$\underline{A} = \underset{(2.8315)}{8.5878} - \underset{(1.3083)}{0.65324}\,\underline{P} - \underset{(1.3635)}{2.8712}\,\underline{G} \qquad \begin{array}{l} \underline{R}^2 = .10 \\ \underline{n} = 41 \end{array}$$

$$\underline{C} = \underset{(14524.)}{35054.} - \underset{(6711.1)}{1553.2}\,\underline{P} - \underset{(6994.4)}{15217.}\,\underline{G} \qquad \begin{array}{l} \underline{R}^2 = .11 \\ \underline{n} = 41 \end{array}$$

Note. Where:

$\underline{A}$ = number of arrests for persons with 1 or more arrests.
$\underline{P}$ = 1 if no-preschool, 2 if preschool.
$\underline{G}$ = 1 if male, 2 if female.
$\underline{C}$ = cost of crime for persons with 1 or more arrests.

Numbers in parentheses are standard errors.

Table A5

OLS ESTIMATION OF PRESCHOOLS' EFFECTS ON REAL ANNUAL EARNINGS AT AGE 19

$$\underline{Y} = \underset{(2644.4)}{7226.1} + \underset{(1200.3)}{1106.0}\,\underline{P} + \underset{(1303.0)}{2943.4}\,\underline{G} + \underline{E} \qquad \begin{array}{l} \underline{R}^2 = .05 \\ \underline{n} = 121 \end{array}$$

$$\ln(\underline{Y}) = \underset{(1.3543)}{7.1379} + \underset{(.65567)}{1.1933}\,\underline{P} + \underset{(.66730)}{2.0993}\,\underline{G} + \underline{E} \qquad \begin{array}{l} \underline{R}^2 = .10 \\ \underline{n} = 121 \end{array}$$

Note. Where:

$\underline{Y}$ = real annual earnings.
$\ln(\underline{Y})$ = natural logarithm of Y.
$\underline{P}$ = 1 for those who did not and 2 for those who did attend preschool.
$\underline{G}$ = 1 if male, 2 if female.
$\underline{E}$ = a stochastic error term.

Numbers in parentheses are standard errors.

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